Technical information for private, trunked and public safety networks.

MRT

MOBILE RADIO TECHNOLOGY®

WWW.MRTMAG.COM

APRIL 2002

20

Our 20th year of [illegible]gy

Rebuilding New York networks

Public safety communications recover after 9/11

Affordable AVL

Manage fleets with Web-based dispatch

The chase for interoperability

Ensure the public's safety

A PRIMEDIA Publication

WE MAKE A DIFFERENCE IN CRITICAL COMMUNICATIONS
VERTEX STANDARD
DESIGNED FOR PUBLIC SAFETY PROFESSIONALS

Vertex Standard
We make a difference

US Headquarters
17210 Edwards Rd., Cerritos, CA 90703, U.S.A.
Phone 562/404-2700; Fax 562/404-1210
International Division
8350 N.W. 52nd Terrace, Suite 201, Miami, FL 33166, U.S.A.
For more information, call 562-404-2700. Or visit www.vxstd.com

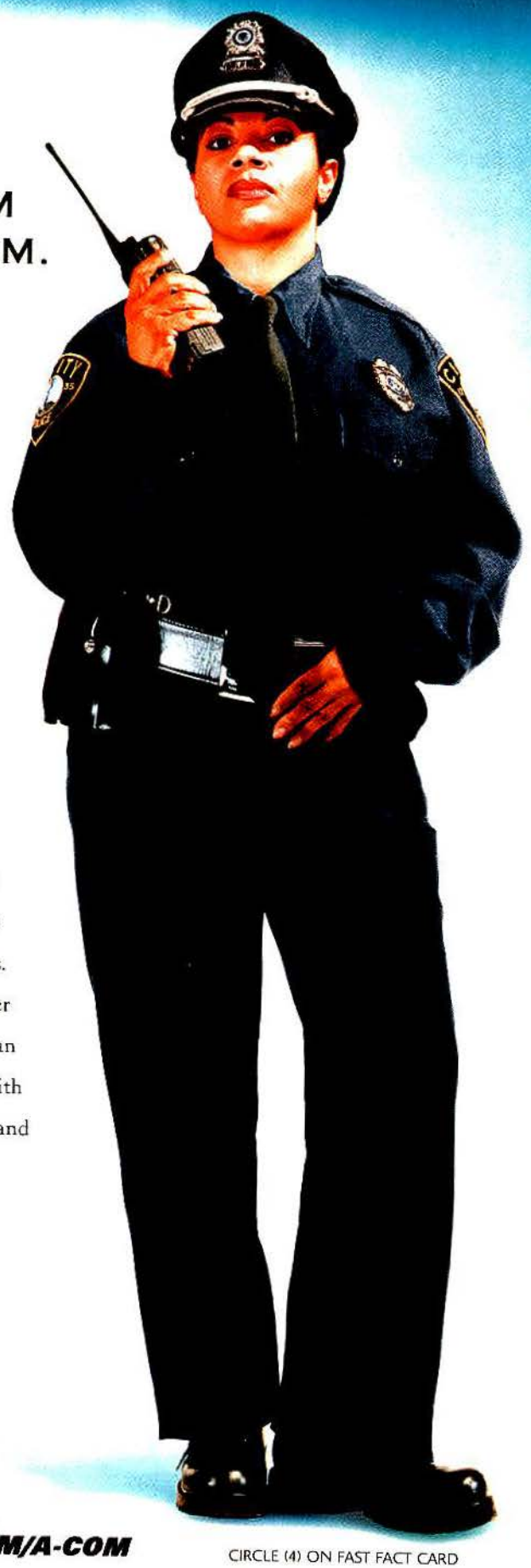
ISO9002

Sukagawa Factory:
Vertex Standard Co., Ltd.
ISO9002 certification

CIRCLE (1) ON FAST FACT CARD

SHE TAKES RISKS EVERY DAY.

WITH OPENSKY,® HER COMMUNICATION SYSTEM WON'T BE ONE OF THEM.



HER JOB:

Whether it's a high speed pursuit, a highly coordinated narcotics operation or a search for a missing person, she needs accurate information — now. M/A-COM's OpenSky Wireless Private Network gives her the ability to communicate instantly with the dispatcher, other police personnel, the ambulance, firefighters, state and regional agencies — virtually anyone on the IP-based mobile network. Anytime. Anywhere.

OUR NETWORK GIVES HER THE EDGE:

The OpenSky digital network merges voice and data onto one radio channel, vastly expanding information-gathering capabilities. (For example, she can communicate with the dispatcher or other officers while running a license plate check in her vehicle — all on the same radio.) There's no need to monitor several channels to know what's going on in a crisis. And there's a built-in Global Positioning System (GPS) so her whereabouts can always be monitored. Also, OpenSky offers an affordable alternative to achieve seamless interoperability with legacy analog equipment. For increased coverage, capacity and quality of service, switch to a better network. OpenSky.

OpenSky

Always on. Always there.

Call 1-877-OPENSKY for more information or visit us on the web.
www.opensky.com

tyco / Electronics / M/A-COM

CIRCLE (4) ON FAST FACT CARD

On the cover: New York public safety communications networks continue to rebuild after Sept. 11. See page 16.

MRT®
MOBILE RADIO TECHNOLOGY
APRIL 2002
Volume 20, Issue 4

Features

16 PUBLIC SAFETY: The recovery continues
James Careless
After losing crucial antenna sites when the towers fell, some New York public safety networks have continued to operate through site replacement and substitutions.

28 RADIO@WORK: Web-based dispatching for the bottom line
Don Bishop
Combining dispatching with GPS offers business owners a powerful tool for managing fleet operations to bring down costs.

38 The pursuit of interoperability
Peter Pflasterer
Interoperability can be accomplished through several methods. Public safety agencies must identify options and make the most feasible choice—temporary or permanent.

46 Getting grounded
Ernest Duckworth Jr., P.E.
Preventing lightning damage to critical electronics equipment can be simple, reliable and inexpensive.

56 Public safety applications for 802.11b
James Careless
Lawrence, KS, police cruisers get fast, secure wireless access.

60 The changing demands of modern battery testers
Isidor Buchmann
With memory no longer posing a problem to battery testers, they have assumed new tasks.

65 American Electric Power defends 800MHz private radio
Don Bishop
Finding Nextel's 800MHz spectrum reallocation proposal to be "retaliatory" toward utility companies, AEP explains why Nextel should be held accountable for resolving radio interference.

72 Remote-control voice-over-Internet protocol
Don Bishop
Replace a $100,000 switch with a $1,000 PC? It's possible with a remote-control VoIP system.

Departments

4 In sync
Don Bishop
Just do it

6 Letters

8 Making waves
Nikki Chandler
The fear of flying

10 In the public interest
Robert H. Schwaninger Jr.
Let's hear it for the broads

14 Public safety: '10-2'
David O.Dunford
Communications cutbacks

24 Technically speaking
Harold Kinley, C.E.T.
Intermod: Getting the upper hand

74 Point-of-sale perspective

75 20/20 visions & Tuning in
Motorola tops survey results

80 Product focus: Base antennas

81 Ad index

82 Products

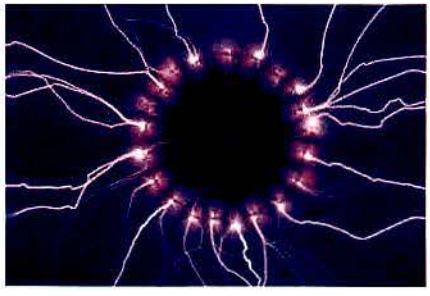
86 Changing channels

87 Pack your suitcase

87 Editorial index

88 Classified

96 Roger that
Disrespect of amateur radio on Sept. 11.



A reliable, well-engineered grounding system can help eliminate potential harm from lightning strikes. See page 46.

Mobile Radio Technology, **Volume 20, Issue 4**, ISSN 0745-7626 is published monthly by PRIMEDIA Business Magazines & Media Inc., 9800 Metcalf Ave., Overland Park, KS 66212 (**primediabusiness.com**). Periodicals postage paid at Shawnee Mission, KS, and additional mailing offices. Canada Post Publication Mail (Canadian Distribution) Sales Agreement No. 0956309. Current and back issues and additional resources, including subscription request forms and an editorial calendar, are available on the Web at **www.mrtmag.com.**

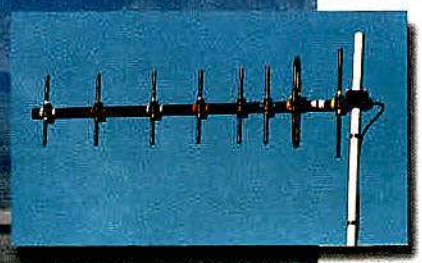
SUBSCRIPTIONS: *Mobile Radio Technology* is mailed free to qualified subscribers within the United States and Canada. Non-qualified subscribers may subscribe at the following rates: United States: one-year: $35; Canada: one-year: $45. Qualified and non-qualified subscribers in all other countries: one-year: $45 (surface mail); $90 (air mail). Subscription information: P.O. Box 12960, Overland Park, KS 66282-2960.

POSTMASTER: Send address changes to *Mobile Radio Technology*, P.O. Box 12960, Overland Park, KS 66282-2960.

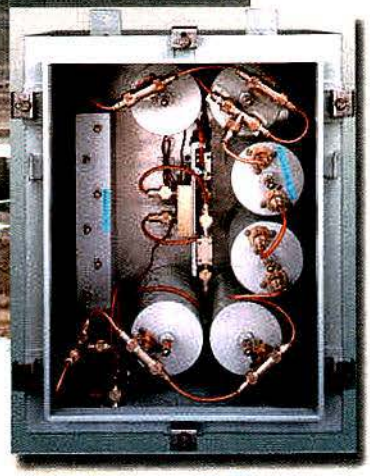
"COMING THROUGH LOUD AND CLEAR ..."

- Antennas
- Combiners
- Wattmeters
- Duplexers
- Filters
- System Design

Telewave, Inc. delivers high performance ... everywhere, everytime.



We bring 30 years of product engineering and system design expertise to the table for every customer, large or small.



With a full line of standard products, and the ability to quickly create custom designs for special projects, Telewave provides unmatched support for Public Safety, Government, and Business radio systems.

Call us today at 1-800-331-3396, and discuss your requirements with our expert sales engineers, or visit us at www.telewave.com

Telewave, Inc.
660 Giguere Court
San Jose, CA 95133

CIRCLE (5) ON FAST FACT CARD

TELEWAVE, INC.®

Radio System Manufacturer since 1972

Just do it

Want to know what to do about the "FCC Notice of Proposed Rulemaking in The Matter of Improving Public Safety Communications in the 800MHz Band and Consolidating the 900MHz Industrial/Land Transportation and Business Pool Channels"?

Ignore it.

Yes, ignore it.

But only if you're in a special class of radio users called, "Public Safety—Ready Now."

We're talking about the FCC proceeding that considers proposals made by Nextel Communications, the National Association of Manufacturers and MRFAC (formerly called the Manufacturers Radio Frequency Advisory Committee). Those proposals would reallocate radio spectrum in a way intended to mitigate interference from commercial mobile radio service systems that use low-elevation, low-power base stations with digital modulation in a cellular architecture for frequency reuse.

Most of the interference complaints come from public safety agencies using radio systems configured with high-elevation, high-power base stations with analog modulation for economical coverage with comparatively few sites—sometimes with simulcast. Some analog CMRS, B&I/LT and other digital system operators also receive interference.

Interference complaints from agencies in as many as 28 states have been linked to Nextel's 800MHz digital enhanced specialized mobile radio operations. When Nextel's digital ESMR base stations transmit, communications with mobile and portable public safety radios in the immediate vicinity may become garbled or blocked.

Nextel submitted a far-reaching proposal that would require public safety agencies using 800MHz to change frequencies as would Nextel. Moving to opposite ends of the 800MHz band, the two incompatible types of radio systems could operate with less, if any, interference—except perhaps near the frequency boundary between them.

The FCC has stated that 1,320 public safety licensees would have

to change their operating frequencies. An additional 2,100 B&I/LT licensees would have to change frequencies, along with 1,100 SMR licensees. These figures apply to the Nextel proposal. Significantly fewer licensees would have to change frequencies under the NAM proposal.

Not everyone has spoken. You and anyone else can tell the FCC what you think about the Nextel or NAM proposals. You can answer the FCC's questions and submit your own ideas. The deadline for sending your comments is 30 days after the *Federal Register* publishes the FCC's notice. As of early April, the clock had not yet started.

Various trade associations and large private system operators are refining a proposal resembling NAM's that would move system frequencies here and there within the 800MHz band. Such a plan would avoid the need for moving 800MHz systems to frequencies in the 700MHz and 900MHz as Nextel's plan would require. Such a change would involve multiple complexities including gigantic equipment change-out costs, incumbent TV stations in the 700MHz band and channel bandwidths in the 900MHz band.

You can get a preliminary look at the various proposals along with the FCC's Notice on the Industrial Telecommunications Association Web site at **www.ita-relay.com**. Click on "Nextel 800MHz Band Proposal Updates."

What does all this have to do with ignoring the notice?

If your public safety agency has plans in the works for upgrading its system and using 800MHz frequencies to do it, go ahead.

Look what's happening to system operators who are putting off decisions until frequency refarming of the VHF and UHF bands is completed. They're still waiting.

Look what's happening to system operators who are delaying decisions until frequencies in the 700MHz band become available. In many geographic areas where channels for public safety communications are needed most, they have to wait until incumbent TV stations vacate the frequencies. They may be waiting a long, long time.

If your expenditure isn't excessive, your need is immediate and your timetable for construction is relatively short, you should obtain your 800MHz licenses and build or expand your system. You'll be getting life out of your new system while other agencies allow a wait-and-see attitude to consume years of valuable time.

You have to be careful about public dollars you spend, that's certain. At the same time, you have an obligation to the first responders on the street.

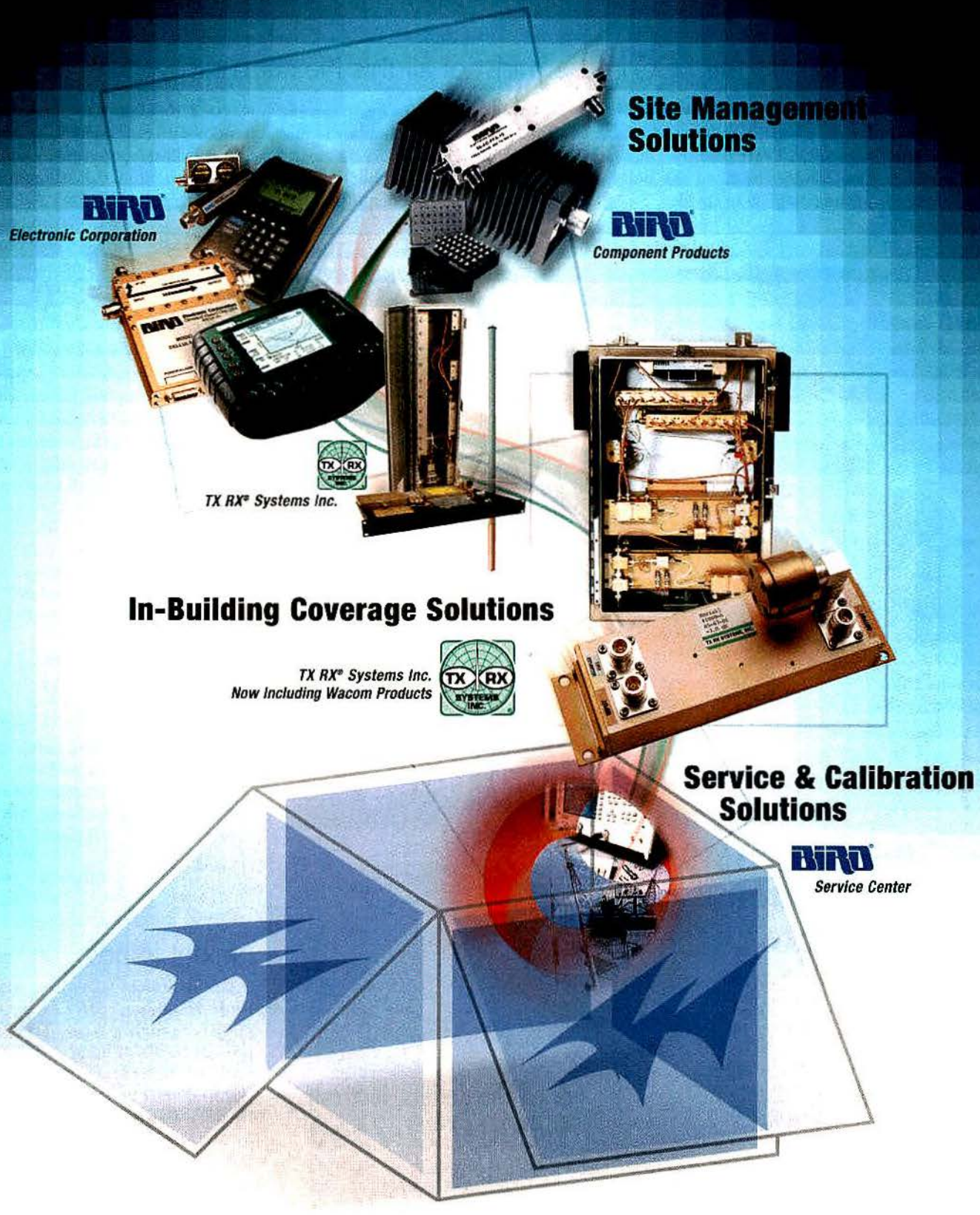
If you're ready now, go ahead with your 800MHz project.

Ignore the notice.

Don Bishop

Editorial Director
dbishop@primediabusiness.com

Visit Booth #12027



Site Management Solutions

BIRD Electronic Corporation

BIRD Component Products

TX RX® Systems Inc.

In-Building Coverage Solutions

TX RX® Systems Inc.
Now Including Wacom Products

Service & Calibration Solutions

BIRD Service Center

Providing Solutions to our Wireless Customers

Bird® Technologies Group provides **Site Management**, **In-Building Coverage** and **Service Solutions** to the Wireless & Public Safety Market. **Visit Booth #12027** and register daily to WIN a Computer Entertainment System, DVD Player, and Sony Movie and Music Gift Certificate.

BIRD TECHNOLOGIES GROUP

CIRCLE (6) ON FAST FACT CARD

'Where is the FCC in the midst of all this Nextel controversy?'

I congratulate *MRT* on its continued dissection of the Nextel shenanigans. The February 2002 edition totally "knocked the ball out of the park," so to speak.

Anyone with half a brain can see that Nextel's 800MHz plan is just what it appears to be: a scam to get more bandwidth, higher market value and culpable deniability for Nextel's atrocious and illegal interference with public safety and business wireless operations.

Throughout all this, though, one must ask the question "Where is the FCC's dreaded Enforcement Division?" Is the era of Michael Powell one of "turn the other cheek," or "turn a blind eye?" Is it reminiscent of Clinton's nefarious "Don't ask, don't tell?"

The FCC will be the first to jump on shortwave "pirate" radio stations, non-compliant ham radio operators or CB'ers and punish through equipment confiscation and heavy fines. Yet, where is the FCC in the midst of all this Nextel controversy? Have they been bought off by Nextel kick backs? What happened to the unwritten rule of "He/she who causes interference must fix the problem?"

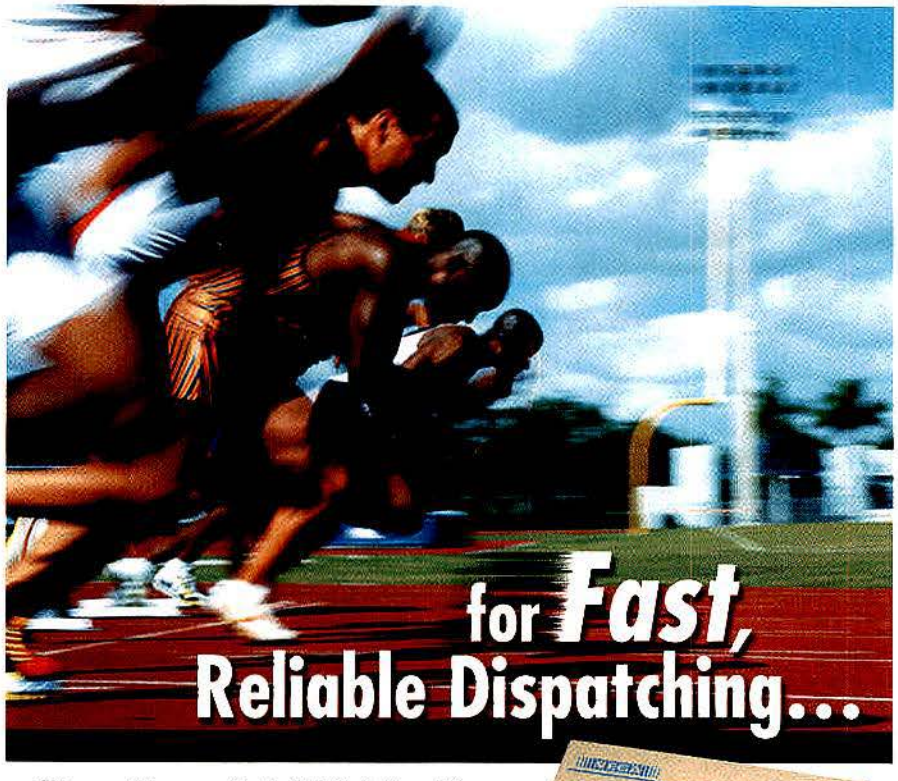
"Where's the beef," or the FCC for that matter?

The FCC needs to start doing its job, or else admit to the public that it is truly a "paper tiger."

Chairman Powell, it is "put up or shut up" time. Either step up to the plate or go home and eat cookies with your Nextel playmates.

Keep up the great work, *MRT*.

—D. Loren Fields, N1UMF
Augusta, Maine



New Vega C-1610 Six Line Console with DSP Architecture.

- Dual sequential Tone Line Module cards for up to 6 lines
- Flexible line configuration for either a dedicated two- or four-wire full duplex circuit, or local control keying
- Vacuum florescent display
- Squelch and Line activity indicators flash upon detecting audio
- Optional desk microphone, headset, handset or gooseneck
- And much more!

For all the details, just call
1-800-752-7560

or fax (402) 467-3279
Email: vega_signal@earthlink.net
www.vega-signaling.com

MEGA

TELEX Communications, Inc.

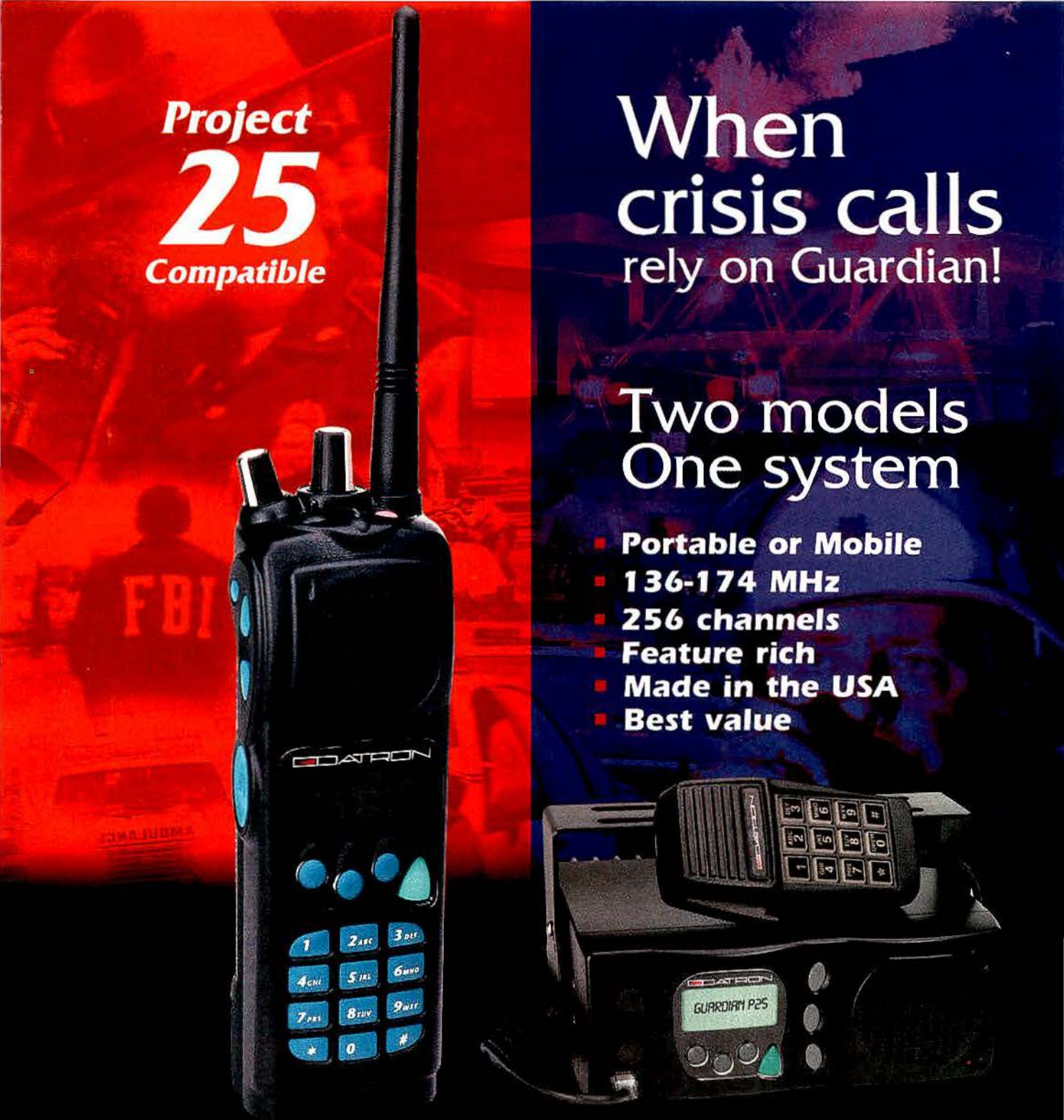
CIRCLE (7) ON FAST FACT CARD

VISIT US AT IWCE, BOOTH #10075

Nextel issues

Great article ("Dealing with a Rude Neighbor," *MRT*, February 2002) covering the past and present issues at hand with Nextel and its dedicated, well-known Form 600/601 printing press. Does Nextel's IDEN system, developed by Motorola, stand for Nextel "Interference Denying Every Neighbor" of reliable communications? Great reading.

—David W. Moriarty
Project Manager-Communications Systems
HNTB


Project
25
Compatible
When
crisis calls
rely on Guardian!
Two models
One system
Portable or Mobile
136-174 MHz
256 channels
Feature rich
Made in the USA
Best value

High performance digital radio for government, public safety and business. Features include 16 zones • 4 channel banks • shadow channels user-defined keys • P25 analog, digital, wide and narrowband operation DES encryption • easy-grip knobs • large keys • backlit display • full line of optional Guardian user accessories.

GUARDIAN™
THE VITAL CONNECTION

TITAN SYSTEMS CORPORATION
DATRON WORLD COMMUNICATIONS DIVISION

Visit Us At IWCE Booth #10101
CIRCLE (8) ON FAST FACT CARD

Contact us today: 760.597.1500 ▪ www.dtwc.com ▪ guardian@dtwc.com
DATRON WORLD COMMUNICATIONS INC. 3030 Enterprise Ct. Vista, CA 92083

The fear of flying

I have never been afraid of flying before. But I haven't flown since Sept. 11. You may think that I am afraid of terrorism (I am), but the fear that I must face now is airport security.

The International Wireless Communications Expo is usually my first trip of the year. In making travel arrangements this year, it hit me that I will have to go through the increased security—for good reason. But it still scares me.

I don't have anything to hide. It's just that I've heard stories of people having to take off their shoes and empty their bags and go through pat-downs. But that probably *is* the best way right now to prevent further incidents on planes.

It could be better, though. By increasing efficiency in airport security operations, flying can be safer. How do we do that? Through better communications, of course.

Aiports have always used radio communications, from portables to pagers. New technologies and products are on the horizon, however, that will affect the efficiency of security, thus increasing passenger convenience.

We have to be careful, though. We could go too far, increasing passenger *inconvenience*. Biometrics, the digital analysis of biological characteristics such as facial features, irises or fingerprints, could consume time and space in airports (according to aviation experts). And there's always the privacy issue. Although when it comes to getting on a plane, I don't know that we have much privacy as it is. I'm sure terrorists would love more privacy.

Other solutions are coming down the pike, though. Aether Systems is testing its software at Boston's Logan International Airport. Massachusetts state troopers are carrying Blackberries equipped with software such as Aether's PocketBlue. It allows officers patrolling the airport's parking lots to check license plates and track taxi drivers' registration. The officers also randomly talk with passengers, using the devices to check the National Crime Information Center for outstanding warrants.

ARINC and Motorola have launched a nationwide dispatch system at Newark International, Miami International and Los Angeles International. The system combines IDEN with ARINC's communications networks. A baggage handler on one coast can speak to a customer service representative on another coast at the push of a button. The service is supposed to lead to increased operating efficiency and reduced turntime at the gates. The handsets used in the system combine a digital wireless phone with Internet access, text messaging, two-way radio and data access.

We all know that radio improves efficiency and safety in any job. Airports must make passenger safety their first priority while weighing the importance of convenience and smooth operations. After all, people can choose not to fly.

Managing Editor
nchandler@primediabusiness.com

Need remotes? Call Us

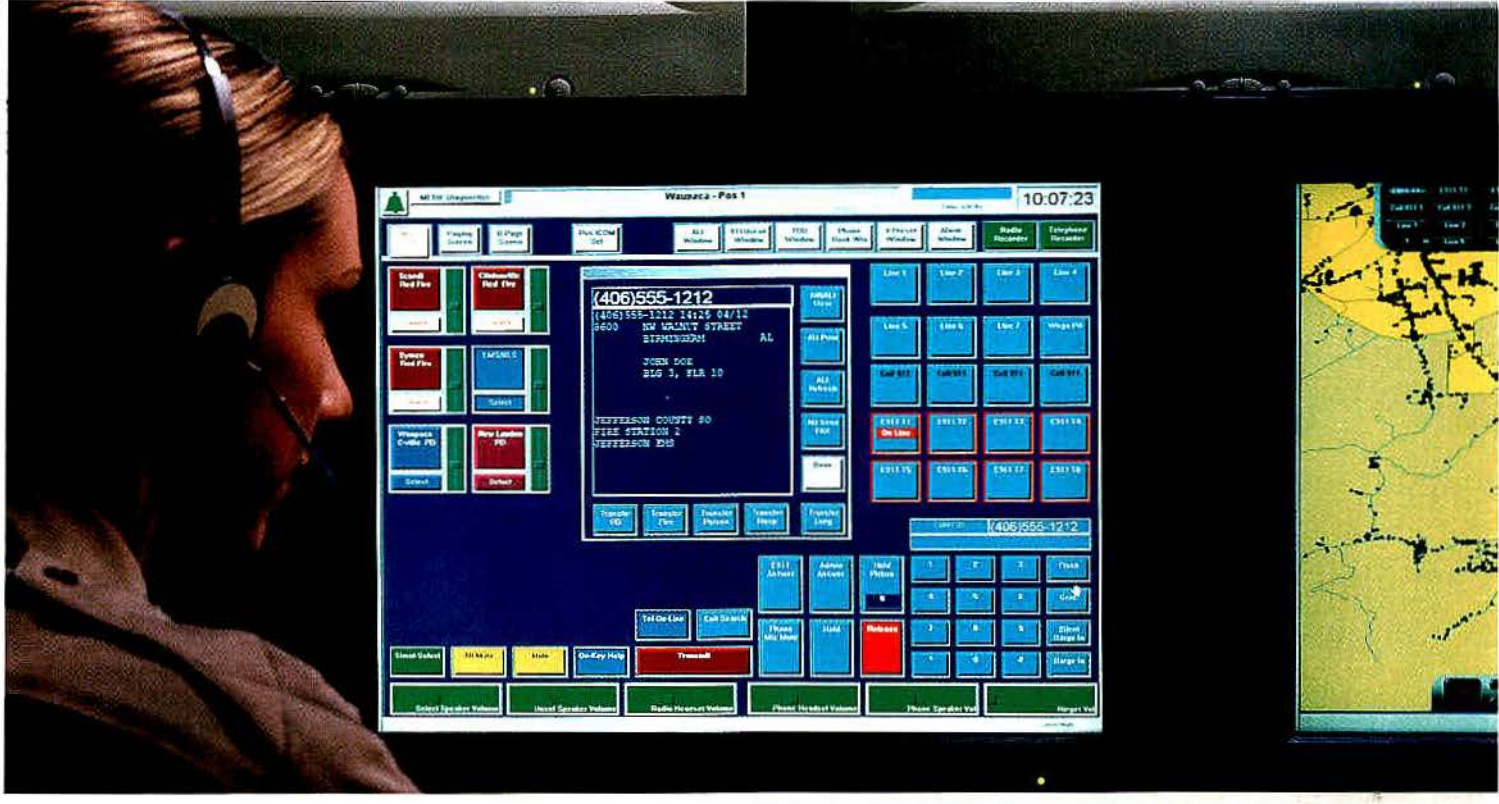
CPI manufactures a broad line of DC, Tone, Local Extension, Multi-Channel, and Multi-Line remotes and termination panels for most radio systems.

The CPI line of Multi-Channel remotes include systems for the Kenwood -80 (TSR412/TSP402) and -90 (MCP411/MCP401) series and many Motorola models including the CDM1550(LS), (MCR211A/MCP200C) and the M1225 Series. For additional information on the complete CPI line of products please call us or visit our website.

941 Hensley Lane • Wylie, TX 75098
Phone: (800) 869-9128 (972) 429-7160
Fax: (972) 429-7165
www.cpicomm.com

CIRCLE (9) ON FAST FACT CARD

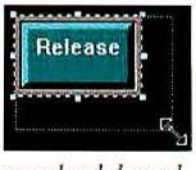
VISIT US AT IWCE, BOOTH 13069



LET YOUR E911 TELECOMMUNICATORS FOCUS ON THE EMERGENCY NOT ON THE COMPLEXITIES OF THEIR CONSOLE.

A simple one button answering system that automatically captures the oldest call first.

You can easily customize any screen to their needs. Buttons can be easily resized, moved and changed.



System changes can now be made by the customer instead of expensive factory programmers. Levels on an E911 Trunk are easily adjusted.

The E911 component of the new UltraCom™ E911/ Radio Dispatch Console System is the easiest for telecommunicators to learn and use. All screen buttons are in plain text, no icons. Our 100% user programmable touch screens can be easily set up to accommodate any situation. And on-board help is always just a key stroke away.

This is an all digital, 32-bit Windows, single application system. Telcordia and NENA compliant handling both E911 and ADMIN lines. Built from the ground up. by us - not a collection of older multiple systems.

The UltraCom includes over $25,000 worth of Management Information software built in at no extra cost. Data is buffered at each position saving the expense of redundant servers. E911 data is archived on DVD-RAM. CAD/Mapping can be provided. Software upgrades are always free.

Every UltraCom E911 console system contains all the software necessary for a state of the art radio dispatch system. The only cost is hardware - saving as much as 50%.

To help your telecommunicators overcome complexity when seconds count, contact Moducom today.

MEDIC Diagnostics

Our state of the art diagnostics not only spots trouble, it recommends immediate corrective action. This could mean up to a 50% savings in support costs.

Radio dispatch is part of the UltraCom system software. This means you only need to add minimal hardware to obtain a single application E911 and radio dispatch console system.

Main Radio Screen

Free Demo

Demo our cost saving system software or request a brochure at www.moducom.com or call us at: 818-764-1333

MODUCOM

COST EFFECTIVE NOW.
MORE COST EFFECTIVE OVER TIME.

See us at the NENA Show, June 16-20, Booth #549

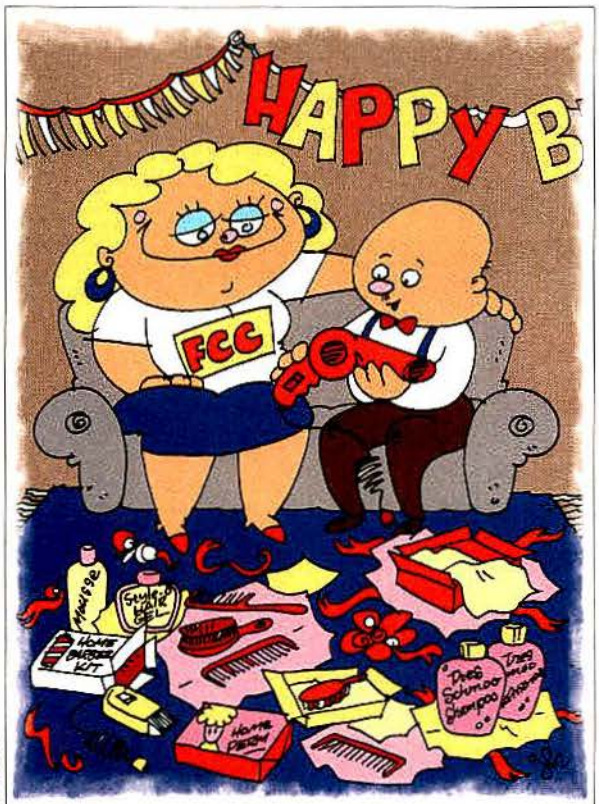
CIRCLE (10) ON FAST FACT CARD

MODULAR COMMUNICATION SYSTEMS, INC. 13309 SATICOY ST. NORTH HOLLYWOOD, CA 91605. E-MAIL: moducom@ix.netcom.com

Let's hear it for the broads

By Robert H. Schwaninger Jr.

Over the past month or so the FCC has been spending all of its time talking about broadband. Encouraging the deployment of broadband services to the marketplace, whether by wire or flying through the air, is one of the commission's greatest concerns.



"Why, thank you, Dear... It's just what I needed!"

Illustration by John Hayes

In fact, on Valentine's Day, a day that is revered by females and dreaded by all males, the FCC delivered hearts to all of the broad services it could find by releasing three public notices—all dealing with its efforts to press for broader, wider and ultrawider services across the nation.

The first notice gave 50MHz of spectrum in the 4.940GHz–4.990GHz band to public safety. According to the commission's public notice, this spectrum will support new broadband applications such as high-speed digital technologies and wireless local area networks. So, with a little help from the National Telecommunications and Information Administration and a nod from adjacent-channel U.S. Navy operations, public safety just got more spectrum than the PCS operators. Bet you didn't give your honey a $20 billion box of candy.

But because public safety is still the sweetheart of every politician from Rudy Guilliani to Kathleen Abernathy, there's more. Tossed into the collection on the corner was another radio service dubbed ultra-wideband. The FCC launched its efforts to bring to the market unlicensed radio devices with nearly unlimited bandwidth, to be used primarily as imaging devices.

Under Part 15 of the agency's rules, public safety will now be armed with RF devices that can see through walls—like those magic glasses they advertise in the back of comic books. The FCC's rules would allow operation below 960MHz and in the 3.1GHz–10.6GHz band for devices that would "see" below ground or into a wall. Mind you, if you want to see *through* the wall then you can also use the 1.99GHz–3.1GHz band.

But there's still more. The ultra-wide band use also includes medical imaging systems that can employ the 3.1GHz–10.6GHz band. We recommend that these systems not be used on male patients standing against a wall, to avoid the term "stud" being misused in a medical diagnosis. We further caution against use of these imaging systems for determination of alcohol content because the term "plastered" might be misconstrued.

Ultra-wideband services will also include surveillance systems that will construct a stationary field of RF energy at 1.99GHz–910.6GHz to detect disturbances in the force, like vehicle radar systems that will tell you immediately before you back into that cherry-red Miata, and high-speed networking systems for LAN operations.

Forget OSHA. If it's broadband, you can radiate your home, office, walls, ground, car, body and any darn thing you want. And don't try hiding. This stuff goes through walls, rooftops and even caves.

Not to stop there, the FCC tossed bouquets to the wired wideband wonks as well. The FCC announced its proceeding to promote widespread deployment of high-speed Internet access services to "encourage the ubiquitous availability of broadband access to the Internet to all Americans." The promotion of broadband includes a roster of things the FCC won't do.

In a particularly telling fashion, the commission decided that the best way for it to encourage the delivery of high-speed Internet service was to not regulate it. By passing no rules, laws or policies, the agency believes that it is doing its part to promote the development of high-speed services ... er ... components.

You see, the FCC decided in a split decision that high-speed Internet ... um, whatever ... er, fa-

Schwaninger, *MRT's* regulatory consultant, is the principal in the law firm of Schwaninger & Associates, Washington, which is counsel to Small Business in Telecommunications. Schwaninger is also a fellow of the Radio Club of America. His email address is *rschwaninger@sa-lawyers.net*.

TEST IT! ANALYZE IT! OPTIMIZE IT!

BERKELEY'S WIRELESS PRODUCTS KEEP YOUR SYSTEMS RUNNING SMOOTHLY!

Mongoose™

SIGNAL STRENGTH METER

For indoor sweeps by propagators.

- Internal memory stores signal strength
- Scans up to 21 channels
- Displays best 3 channels simultaneously
- Outputs data to a PC with a serial cable
- Headphones or internal speaker for audio
- Includes Ni-Cad battery/charger

The Lizard™

1 WATT PORTABLE TRANSMITTER with REMOTE CONTROL

For indoor coverage testing.

- Adjustable power control from 1 milliwatt to 1 watt output
- Infrared remote control adjusts power output, frequency and on-off >25 feet
- Battery operated

INDOOR MICROCELL TEST PRODUCTS

www.bvsystems.com/microcell

WIRELESS LAN TEST PRODUCTS

www.bvsystems.com/wlan

DRIVE-TEST AND WALK-ABOUT PROPAGATION ANALYSIS

www.bvsystems.com/drivetest

New! Cricket™

IEEE 802.11 RECEIVER

Tests Frequency Hopping

- Measures coverage for Spread Spectrum (FHSS) wireless networks (wideband IF 1 MHz)

New! Locust™

IEEE 802.11b RECEIVER

WLAN Drive-Study Analyzer

- Measures direct sequence (DSSS) wireless networks (IF wideband 22 MHz)
- Removable data storage & output capability
- Internal GPS

WLAN Measurements:

- 2.4 GHz ISM band
- Signal strength
- Multipath
- PER (Packet

All BVS WLAN products come with a rugged carrying case, charger, batteries and accessories.

New! Grasshopper™

IEEE 802.11b RECEIVER

Tests DSSS Networks

- Detects & differentiates from narrowband multi path interference such as microwave ovens & frequency hopping systems

The Fox™

RUGGED HAND-HELD SIGNAL STRENGTH METER

Measures RF propagation coverage and detects "RF Shadows".

- High measurement rate, more than twice that of Dr. Lee's recommended 40 λ
- Internal eight channel differential GPS
- Removable PCMCIA memory system for post processing data import to a PC

The Coyote™

DUAL MODULAR RECEIVER

Measures RF propagation coverage and detects "RF Shadows".

Two Independent Receivers

- Dual modular receivers and 12-channel GPS allow users to swap various bands while in the field
- High measurement rate, more than twice that of Dr. Lee's recommended 40 λ plus distance averaging
- Removable, rechargeable Li-Ion battery system
- Removable 8 MByte compact flash memory system

The Gator™

CLASS A TRANSMITTER SERIES

For measuring signal propagation, positioning antennas, setting power levels or validating coverage.

- Available in either 25 Watt Class A, or 45 Watt Class A (10 or 20 Watt Class A for PCS) FCC Type Accepted
- Built-in agile frequency synthesizer
- Remote controllable

BERKELEY VARITRONICS SYSTEMS WIRELESS PRODUCTS

Liberty Corporate Park, 255 Liberty St., Metuchen, NJ 08840

Phone: 732-548-3737

www.bvsystems.com

Fax: 732-548-3404 • E-mail: info@bvsystems.com

We are a Valued Added Reseller for...

symbol

MapInfo

For your convenience we accept...

MasterCard VISA DISCOVER AMERICAN EXPRESS

IEEE 802.11 • PAGING (POCSAG/FLEX) • IS-136 • GSM • LMR • iDEN/SMR • ETACS • CELLULAR • ISM • PCS • WCS • MMDS • UMTS

CIRCLE (11) ON FAST FACT CARD

cilities are "information services" and not "telecommunications services," despite having "telecommunications services" delivered over information services facilities. Therefore, the agency did not need to regulate these facilities the way they regulate telecommunications services. The agency did leave open the question of whether these providers need to contribute to the Universal Service Fund, (whatever they're doing).

The FCC's efforts to co-opt the slogan "wider is better" from the car manufacturers leaves open a vital question that even Verizon, SBC and Bell South can't answer: "Where's the money coming from to pay for this?"

Although I applaud the FCC's gift to public safety in delivering 50MHz of spectrum in the 4.9GHz band and launching the availability of devices that can actually see through walls so I can spy on my secretary to see if she's filing my work or her nails, the cost of the equipment is likely to be beyond the reach of many of the agencies that might consider using these devices.

As for high-speed Internet service, the commission needs to read the business section of the newspaper rather than the ex parte submissions of the broadband carriers. As reported in almost every business publication, the problem isn't regulation; it's consumer resistance to the high cost of the service. When given a choice between dial-up at about $10 a month and high-speed DSL or cable at $50 a month, consumers have silently said, "Keep the high-speed stuff. I need to use that 40 bucks to pay for the rising [unregulated] cost of cable television."

So, customers are opting for HBO over DSL. All of the deregulation of high-speed Internet services cannot change this basic buying decision. The only thing high-speed Internet providers can do to alter customers' choices is to lower the price. But right now the FCC isn't looking at price tags. It's just adding to the broad inventory of available services. ■

A PRIMEDIA Publication

MRT
MOBILE RADIO TECHNOLOGY®

Editorial Director—Don Bishop, *dbishop@primediabusiness.com*
Editor—Roger Lesser, *rlesser@primediabusiness.com*
Managing Editor—Nikki Chandler, *nchandler@primediabusiness.com*
Associate Editor—Kari Taylor, *ktaylor@primediabusiness.com*
Senior Art Director—Maurice Lydick, *mlydick@primediabusiness.com*
Art Director—Jani Duncan, *jduncan@primediabusiness.com*
Contributing Editor—Harold Kinley, C.E.T., *halkinley@charter.net*
Contributing Editor—Donald E. Koehler, *AFDEKI@uaa.Alaska.edu*
Contributing Editor—Patrick Buller, *W7rqt@msn.com*
Public Safety Consultant—David O. Dunford, *Lenexa, KS, Police Department*
Regulatory Consultant—Robert H. Schwaninger Jr., *Schwaninger & Associates, Washington, DC*
Editorial Advisory Board—John Abbey, *The Abbey Group*; Elliott Hamilton, *Wireless IT Research Group*; Richard P. Irby, *P.E., SiteSafe*; Alan Burton, founder, *Dispatch Monthly magazine*; Gene A. Buzzi, *RCC Consultants*; Jack Daniel, *The Jack Daniel Company*; Gary David Gray, P.E., *Orange County Communications*; Frederick G. Griffin, P.E., *Frederick G. Griffin P.C.*; Jim Hendershot, *Radio Design Group*; Samuel J. Klein, *Technical Associates LLC*; S.R. McConoughey, P.E., *Mobile Communications Consulting*; Art McDole, *Salinas, CA*; Tony Sabino, *Regional Communications*; Robert C. Shapiro, P.E., *Strategic Telecommunications*; Leon Spencer, *ExxonMobil Global Services*; Gregory M. Stone, Ph.D., *Quantum Radionics*; Tom Tolman, *National Law Enforcement and Corrections Technology Center*; Raymond C. Trott, P.E., *Trott Communications Group*; William A. Wickline, P.E., *Mentor, OH*.

Vice President—Larry Lannon, *llannon@primediabusiness.com*
Publisher—Mercy Contreras, *mcontreras@primediabusiness.com*
Advertising Sales Manager—Joyce Bollegar, *jbollegar@primediabusiness.com*
Advertising Sales Coordinator—Scot Frank, *sfrank@primediabusiness.com*
International Sales—Stephen Bell, *stephenbell@email.msn.com*
Classified Sales—Dawn Rhoden, *drhoden@primediabusiness.com*
List Rental Services Representative—Scott Perrillo, *sperillo@statlistics.com*
Advertising Services Manager—Karen Clark, *kclark@primediabusiness.com*

Vice President, Production—Thomas Fogarty, *tfogarty@primediabusiness.com*
Production Manager—Melissa Langstaff, *mlangstaff@primediabusiness.com*
Ad Production Coordinator—Holly Hutchcraft, *hhutchcraft@primediabusiness.com*
Classified Ad Coordinator—Kristi Knupp, *kknupp@primediabusiness.com*

Vice President, Audience Marketing—Christine Oldenbrook, *coldenbrook@primediabusiness.com*
Audience Marketing Director—Barbara Kummer, *bkummer@primediabusiness.com*
Audience Marketing Manager—Sonja Rader, *srader@primediabusiness.com*
Customer Service—800-441-0294

PRIMEDIA
Business Magazines & Media

Chief Executive Officer—Timothy M. Andrews, *tandrews@primediabusiness.com*
President—Ron Wall, *rwall@primediabusiness.com*
Chief Operating Officer—Jack Condon, *jcondon@primediabusiness.com*
Sr. Vice President, Integrated Sales—Dave Lovinger, *dlovinger@primediabusiness.com*
Sr. Vice President, Business Development—Eric Jacobson, *ejacobson@primediabusiness.com*
Vice President, Content Licensing & Development—Andrew Elston, *aelston@primediabusiness.com*
Vice President, Corporate Communications—Karen Garrison, *kgarrison@primediabusiness.com*
Vice President, Finance—Tom Flynn, *tflynn@primediabusiness.com*
Vice President, Human Resources—Greg Furstner, *gfurstner@primediabusiness.com*
Vice President, New Media—Andy Feldman, *afeldman@primediabusiness.com*
Vice President, Technology—Cindi Reding, *creding@primediabusiness.com*

PRIMEDIA Business-to-Business Group—745 Fifth Ave., NY, New York 10151
President & Chief Executive Officer—David Ferm, *dferm@primedia.com*
Chief Creative Officer—Craig Reiss, *creiss@primedia.com*

PRIMEDIA Inc.
Chairman & Chief Executive Officer—Tom Rogers, *trogers@primedia.com*
Vice Chairman & General Counsel—Beverly Chell, *bchell@primedia.com*
President—Charles McCurdy, *cmccurdy@primedia.com*

Member, American Business Media—Member, BPA International

Audited circulation.

***Mobile Radio Technology*, Volume 20, Issue 4**, ISSN 0745-7626 is published monthly by PRIMEDIA Business Magazines & Media Inc., 9800 Metcalf Ave., Overland Park, KS 66212 (**primediabusiness.com**). Current and back issues and additional resources, including subscription request forms and an editorial calendar, are available on the Web at **www.mrtmag.com.**

SUBSCRIPTIONS: *Mobile Radio Technology* is mailed free to qualified subscribers within the United States and Canada. Non-qualified subscribers may subscribe at the following rates: United States: one-year: $35; Canada: one-year: $45. Qualified and non-qualified subscribers in all other countries: one-year: $45 (surface mail); $90 (air mail). Subscription information: P.O. Box 12960, Overland Park, KS 66282-2960.

POSTMASTER: Send address changes to *Mobile Radio Technology*, P.O. Box 12960, Overland Park, KS 66282-2960.

PHOTOCOPIES: Authorization to photocopy articles for internal corporate, personal or instructional use may be obtained from Copyright Clearance Center (CCC) at 978-750-8400. Obtain further information at **copyright.com.**

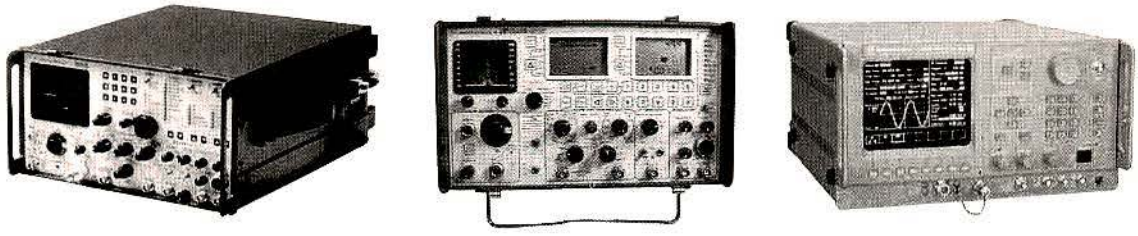
ARCHIVES & MICROFILM: This magazine is available for research and retrieval of selected archived articles from leading electronic databases and online search services, including Factiva, LexisNexis and ProQuest. For microform availability, contact ProQuest at 800-521-0600 or 734-761-4700, or search the Serials in Microform listings at **proquest.com**.

MAILING LISTS: Primedia Business makes portions of our magazine subscriber lists available to carefully selected companies that offer products and services directly related to the industries we cover. Subscriber who do not wish to receive such mailings should contact the Primedia Business subscriber services at 800-441-0294 or 913-967-1707.

CORPORATE OFFICE: PRIMEDIA Business Magazines & Media Inc., 9800 Metcalf, Overland Park, KS 66212, 913-341-1300, primediabusiness.com.

COPYRIGHT 2002
PRIMEDIA Business Magazines & Media Inc.
ALL RIGHTS RESERVED.

Same products. Same people. Same reliability.



New name.

The R2600 family of Communication System Analyzers is now part of General Dynamics. They're the same fine products. Built by the same people. With the same durability and reliability you've learned to trust over the years. The only thing that ***has*** changed...is our name.

So whether your test requirements include iDEN®, ASTRO™, SMARTNET™/SMARTZONE™, SECURENET™ or APCO Project 25, call us.

Be sure to ask about the new features we've introduced this year:

- An available Full-Band Duplex Offset Generator
- RF Frequency resolution down to 50Hz
- Linear Simulcast Modulation (LSM) support for APCO Project 25

And for high-range capabilities at a low-range price, take a look at the R2590, our newest addition to the family—at a price you won't believe.

Call your General Dynamics sales rep today. The name on our products may have changed, but our commitment to quality hasn't changed a bit! Contact us toll free at 1-877-449-0600; in Arizona at 1-480-726-1048; or on the Web at http://www.gd-decisionsystems.com/cte

General Dynamics and the General Dynamics logo are trademarks of General Dynamics Corporation. All other trademarks are the property of their respective owners. ®Reg. U.S. Pat.& Tm. Off. ©2002 General Dynamics Corporation. All rights reserved.

GENERAL DYNAMICS
Decision Systems

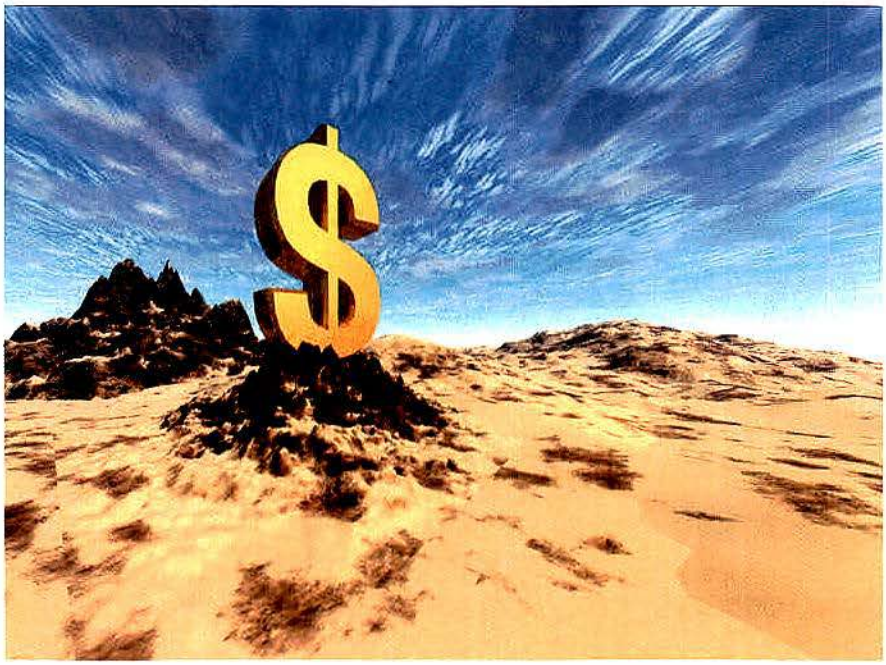
CIRCLE (12) ON FAST FACT CARD

Communications cutbacks

Monetary setbacks mean we have to be creative.

By David O. Dunford

Hard times and hard choices are upon us. From my perspective, even though the newspapers report the recession has ended, it looks like more and more agencies are spending less and less money on radio communications.



The state of Kansas, long known for fiscal responsibility (or simply tightfistedness) is warily eyeing a $680 million shortfall in the budget year beginning in July (just three months away). With the full momentum of the "trickle down" theory in operation, it's only a matter of time before counties and cities are faced with spending cutbacks. These cutbacks are serious to lawmakers, but not like the real financial problems in the private sector where cutbacks equal job losses.

In a typical city government (technically a "municipal corporation"), employee retention and staffing levels are virtual fixtures. When bonded indebtedness approaches a submultiple of assessed valuation, the city's ability to issue bonds (borrow money, buy radios) diminishes. But seldom is anyone let go because if things get really bad, tax increases are an option. All this is predicated on growth in population and assessed valuation, i.e. economic development.

Compare this to a private-sector radio shop that faces upward spiraling health-care costs for a small employee pool, a more rapidly evolving (at least changing) customer base and aged receivables so far out they appear to be at the vanishing point. We must not forget the curious nature of Radioman and the attendant costs of his ongoing care and training. Throw in a serving of deregulated telco costs and the de facto competition to land mobile from the various 2.78935G wireless providers, and it's a miracle that shop owners and system managers keep, as my mother says of her retirement community friends, "their own teeth, their own hair or their own money."

What to do?

What's a fellow to do? Well, we can't keep doing "more with less" as in the past. It looks to me like we'll do "less with less" because the power of positive thinking eventually ends at the doorstep of the Fair Labor Standards Act office or with the Worker's Compensation ad law judge. So if local government is so strapped, what options realistically present themselves for radio communications providers and operators?

We know that price is a consideration, so "it" must be realistically affordable in context of both service and reliability suited to the local jurisdiction. "It" could be priced as a recurring cost service or service-like capital replacement system because of the poor prospects for raising a big lump of money. In the past, "it" was specifically forbidden to be part of any service or system offered to the public. Contemporary wisdom leads us to readily see several advantages to having "it," in some fashion, being strategically attached to a system shared in some form.

"It" isn't a unique product or killer application as wireless entrepreneur firms hope to discover. "It" still comprises its original components of persistence, local commitment and adaptive thinking. I'm still looking for "it." ■

Dunford, *MRT's* public safety consultant, is technical services consultant for the Lenexa, KS, Police Department. He is a member of the Association of Public-Safety Communications Officials–International. You can email Dunford at *mrt@primediabusiness.com*.

Come see what's new...

RELM™ WIRELESS

- IWCE 2002
- Booth #13049

What's new...

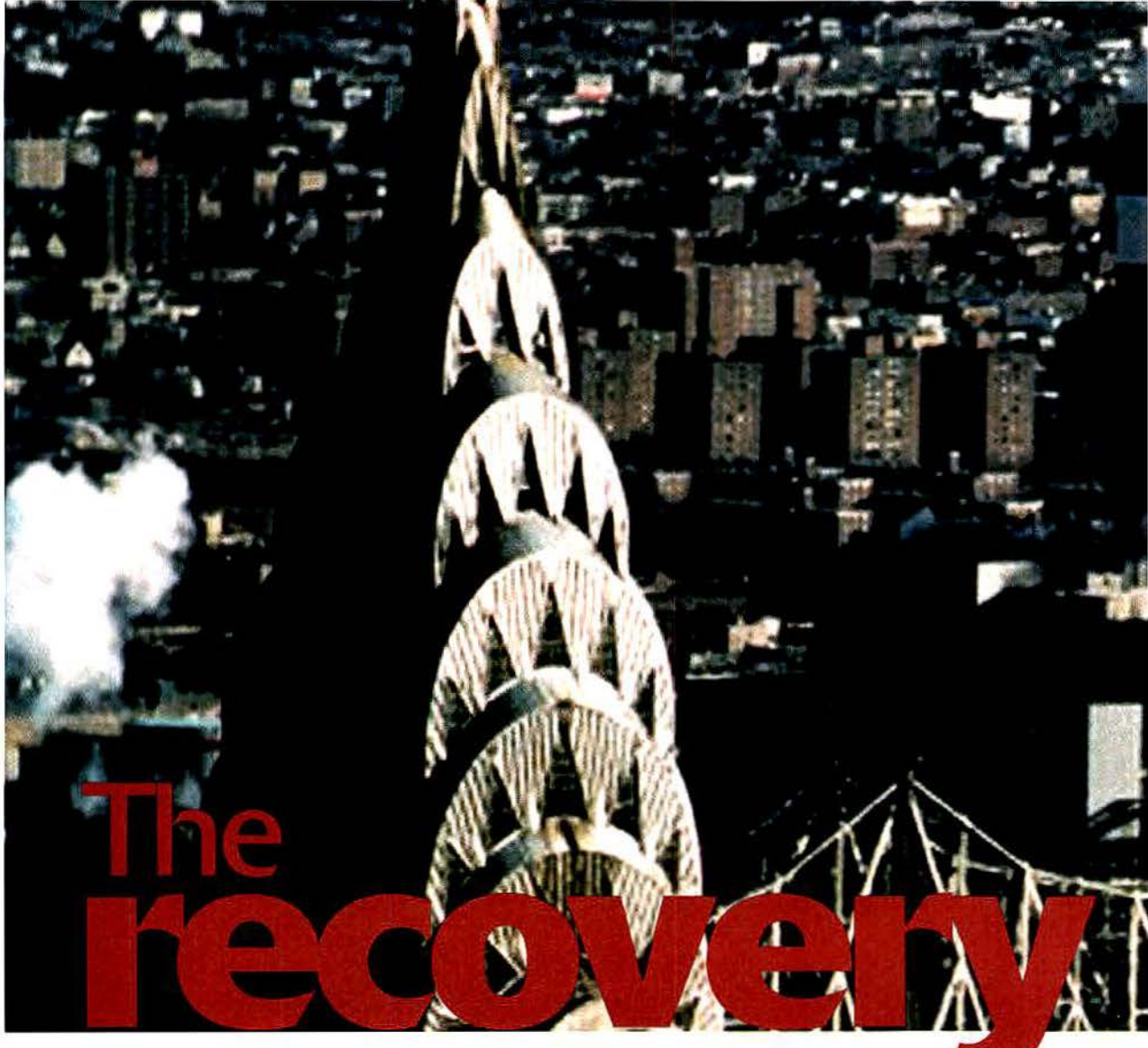
- Affordable Networking Solutions
- Multi-Site Dispatch
- Personal Tracking Systems
- New Portable Radios
- Mobile GPS/Data Radios

RELM Wireless Corporation
7100 Technology Drive West Melbourne, FL 32904
Phone: (800)821-2900 / (321)984-1414 • Fax: (321)984-0434 • www.relm.com

CELEBRATING 55 YEARS

RELM WIRELESS

CIRCLE (13) ON FAST FACT CARD



The recovery

By James Careless

When the Twin Towers collapsed on Sept. 11, New York lost what was arguably the best antenna sites in North America.

At 1,368 feet above street level, 1 WTC (the North Tower) was the tallest building on the eastern seaboard. This is why its 207-square-foot rooftop was dotted with antennas at five-foot intervals. At 1,362 feet, 2 WTC's rooftop was also home to several antenna sites, including the New York State Police's primary transmitter site for its Metro-21 800MHz EDACS trunking system. So the loss of the Twin Towers was a serious blow to public safety operators.

Before Sept. 11, communications site provider Pinnacle Towers was responsible for managing 1 WTC's 42 non-broadcast client antennas. "We covered public safety networks, paging firms, cab companies—the works," said Pinnacle Towers spokesman Joe Furmanek. Even high-level, "confidential" federal law enforcement agencies had sites there, according to Furmanek.

What was lost

So how have New York's public safety networks recovered from the loss of the Twin Towers? Details are sketchy because government officials are reluctant to comment.

When the World Trade Center Towers fell, so did the primary site for the Port Authority of New York and New Jersey's 800MHz Ericsson EDACS trunking system. Also coming down were one of the New York Police Department's 470MHz repeaters, plus two-way 400MHz Motorola systems used by the Federal Bureau of Investigation, the U.S. Drug Enforcement Agency, as well as the Immigration and Naturalization Service. In addition, the New Jersey Highway Patrol lost an 800MHz trunking system that covered two-thirds of New Jersey.

Pinnacle Towers scrambled to return its 1 WTC clients to the air. "Within 20 minutes of the North Tower collapsing, our staff started compiling alternative sites for our clients," said Michael Millard,

Careless is a freelance telecommunications writer based in Ottawa, ON, Canada. His email address is *james@tjtdesign.com*.

continues

After losing crucial antenna sites when the towers fell, some New York public safety networks have continued to operate through site replacements and substitutions.

Pinnacle's vice president of engineering and operations. Pinnacle had two alternative sites to offer: the 687-foot Chemical Bank Building at 277 Park Ave. and the 656-foot Alliance Building at 1345 6th Ave. Although "nowhere near as tall as the WTC was," Millard said, these two properties still gave the area some degree of coverage.

Within hours, Pinnacle located its clients by phone and email and directed them to its alternative sites. "We also called the landlords of both buildings—we only manage their rooftops; we don't own them—and advised them to give anyone with the proper government identification access to their rooftops," Millard recalls. "We didn't worry about paperwork; we just told our clients to get their antennas up as fast as they could, and we'd deal with the details later."

Subcarrier Communications, which also had antennas on the World Trade Center, provided alternative sites, too.

Today, the recovery continues

"What we've been doing is redesigning and re-engineering Manhattan to provide coverage patterns similar to what was destroyed," said John Paleski, Subcarrier's president. "Needless to say, it takes more than one building to replace the WTC site. In fact, in some cases, we've had to use as many as five."

For security reasons, Paleski would not reveal which Subcarrier buildings were providing replacement coverage. However, he said that the sites were chosen and configured using RadioSoft propagation mapping software.

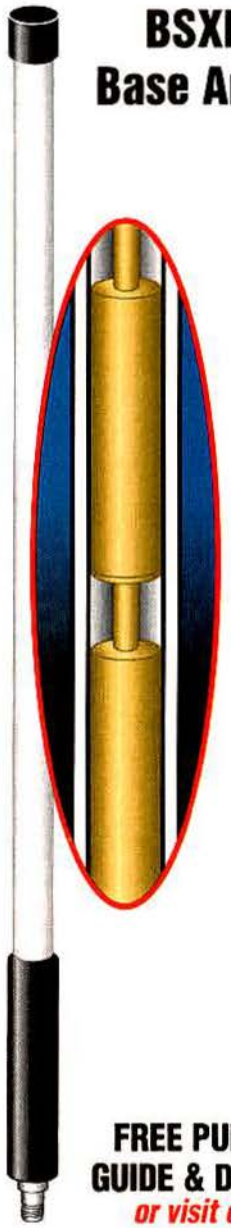
"We took our existing managed rooftops, plugged them into the WTC's RF model, and then saw which properties we had that could help replace the lost coverage," Paleski said. "In some cases, we then had to modify our towers to fill the bill; either by adding steel supports or upgrading their power, telephone or electrical supplies."

This brings us to the tricky part:

Above: The New York State Police coped with the loss of radio networks at the New York World Trade Center by moving some of its radio operations into the Chrysler Building.

You Don't Have to Pay a Premium Price for a Premium Antenna

BSXL Series Base Antennas



Tubular Dipole Element Structure

Epoxy Coated Fiberglass Radome

Aluminum Base with Tough Epoxy Coating

N Connector Termination

No Moisture Problems—Complete Water Drain System

Frequencies Available from 45MHz to 2.5GHz

CALL FOR
FREE PURCHASING GUIDE & DATA BOOK
or visit our website

COMTELCO
www.comtelco.net
1-800-634-4622
630-790-9894 Fax: 630-790-9799
COMTELCO INDUSTRIES, INC.
501 Mitchell Rd.
Glendale Hts., Illinois 60139

Quality products made in the U.S.A. since 1978

CIRCLE (14) ON FAST FACT CARD

Communications at the Pentagon

The Public Safety Wireless Network has released an analysis of how successfully public safety communications worked at the Pentagon on Sept. 11. The report, released in February and called "Answering the Call: Communications Lessons Learned from the Pentagon Attack," includes steps public safety agencies across the country can take to improve their radio communications.

"The Pentagon incident demonstrates in a very public way how critically important communications capabilities are for public safety agencies," said Robert E. Lee Jr., PSWN Program Manager. "Imagine the challenge of 50 different local, state and federal public safety agencies responding at the Pentagon—900 different radio users operating on multiple radio systems, and attempting to communicate with one another."

Surprisingly, the report found that the because of "mutual-aid" agreements, the majority of local public safety responders at the scene experienced little difficulty establishing interoperable communications during the initial response. Most of the first responders had Arlington County's radio frequencies preprogrammed into their portable radio equipment and had frequently used the capability for other mutual-aid responses.

The problem of interoperability arose as increased state and federal agencies arrived to help. No means of direct radio communication was immediately available to these secondary responders.

The PSWN report made the following recommendations for public safety agencies to enhance communications interoperability when responding to major or minor incidents:

1. Develop regional and statewide communications systems.
2. Establish mutual aid agreements and standard operating procedures not only between local agencies but also between state and federal agencies.
3. Employ the Incident Command System to enhance communications efforts in emergency response situations.
4. Conduct mass casualty and disaster response training drills to identify existing capabilities and potential shortfalls.
5. Conduct communications asset inventory to identify tools and their capabilities.
6. Adhere to common technology standards in the design, procurement and implementation of future public safety communications systems.

trying to say definitively where each of New York's public safety networks stands today.

When the World Trade Center collapsed, the NYPD lost a 470MHz repeater. Since then, the police department has compensated by adding boosters to its other repeaters and by adding repeaters at other locations, said NYPD spokeswoman Carmen Melindez.

Meanwhile, the Fire Department of New York had lost a repeater on 7 WTC.

"We lost the repeater after the 47-story 7 WTC, which was damaged by debris and caught fire," said Peter Gorman, president of the Uniformed Fire Officers Association. The loss of this repeater seriously compromised service to firefighters using 15-year-old Motorola hand-helds within the WTC site, he added. This, in turn, may have resulted in some FDNY personnel not hearing the order to evacuate, and thus losing their lives when 1 WTC fell.

In addition, a source with the FDNY said that two phone lines

the PERFECT SUBSCRIBER UNIT

If it's tough enough for the U.S. Army....
The 'F4TR is MIL SPEC, sharing many components with the IC-F3S, the ICOM radio chosen by U.S. Army for its Soldier Intercom (SI) battlefield communications.*

Finally, now there's a radio that's ideal for today's business needs, and offers the capability to grow with tomorrow's technology. ICOM's IC-F4TR offers: 250 channels (selectable wide/narrow by channel); Built-in signalling, including CTCSS encode/decode with reverse burst, DCS encode/decode, and DTMF encode/decode; and a backlit alphanumeric display.

Why invest in equipment that may soon be out of date? ICOM's rugged 'F4TR is designed to take advantage of expected future technology changes.

For tomorrow, the 'F4TR offers: built-in flash memory for quick CPU upgrades; wide/narrow channel spacing; and trunking upgrade paths that grows with your company's communication needs.

3-in-1 selectable trunking/conventional radio:

- PassPort® *(that works!)*
- LTR®
- Conventional

It's the ideal **SMR** unit, designed from the ground up as a trunked radio.

IC-F4TR UHF

SNAP FLASH TRUNKING

For free literature, call 425-450-6088.

www.icomamerica.com

ICOM

FOR PEOPLE WHO MAKE SMART CHOICES

CIRCLE (15) ON FAST FACT CARD

Sept. 11: Amateur radio's badge of honor

The events of Sept. 11 have been well-documented in the media including *Mobile Radio Technology* (November 2001). There were heroes to be sure, but one group of heroes that has received little, if any, attention are the amateur radio operators.

Within a matter of hours, at both the New York World Trade Center and the Pentagon, amateur radio operators were on scene to provide communications to law enforcement and rescue agencies, the American Red Cross and the Salvation Army.

The Pentagon

After the attack on the Pentagon, the American Radio Relay League, a national association of amateur radio enthusiasts, received a request for assistance from the Salvation Army. But before the request was made, the ARRL's Amateur Radio Emergency Service (ARES) was already in action. Tom Gregory, ARRL Virginia Section Emergency Coordinator, helped to direct and coordinate the support effort at the Pentagon. "Early on, it was not clear what the extent of the damage to the Pentagon was," he said. "But even before we had an understanding of what the Salvation Army needed, I contacted a number of volunteers to get them ready to move to the site with their equipment."

Within five hours of the attack, the volunteers were packing up their personal radio equipment and heading for the Pentagon. They arrived the evening of Sept. 11, and emotions ran high when they saw the extent of the damage. "When we got there we saw a gaping hole in the building. It was gut-wrenching," Gregory said. "I couldn't even talk when I first got there and saw what happened. The first couple of days, all the amateur radio volunteers had the same reaction."

Gregory said that volunteers internalized their emotions as best they could. "No one felt very good," he said. "Everyone was very frustrated. But after the first couple of days, people got some form of emotional satisfaction in helping the rescue effort. For me, it was a form of striking back."

The volunteers overcame a number of obstacles when supporting the Salvation Army and the Red Cross. First was determining the amount of effort it was going to take. Starting off with only five or six amateur radio operators operating a few hours a day, the ARRL eventually expanded to operating 24 hours a day. Radio operators worked from what were called "mobile canteens." Their primary focus was logistics support. When the Salvation Army or Red Cross ran out of an item, they notified the radio operator who worked with the headquarters of the Salvation Army and Red Cross.

Gregory observed rescue team members coming to the canteens hot, tired and dirty. He saw what the amateur radio effort did to support the rescuers. "It was very emotional for me to watch the trucks roll up," Gregory said. "As one was about three-quarters empty, the next truck pulled up." The trucks carried everything from food and drink to towels, clean socks and shirts." Gregory watched as trucks carrying bags of ice would pull up and empty. "The trucks just kept coming. It was amazing."

The rescue teams faced an incredible challenge, but so did the amateur radio operators. While all the radio equipment belonged to the amateurs, they didn't have everything they needed. "We needed someone with a portable radio with about 5W of power to communicate back to our base station. But when a volunteer left, he took his equipment with him," Gregory said. "This presented a problem until the people at Vertex Standard were kind enough to donate a Yaesu base station and hand-held radios." This donation enabled the radio operators to set up one station and to avoid having to change out the equipment.

But lack of equipment wasn't the only obstacle they faced. They faced an RF nightmare. "The amount of RF that was present at the Pentagon was unbelievable," Gregory said. "If you could see the RF, the place would have been glowing."

To overcome the noise floor, the volunteers realized they needed more power. An amateur radio group in Stanford, VA, packed up its repeater and brought it to the site. The repeater was set up at the Pentagon with a 35-foot antenna. This installation solved most of the amateurs' communications problems.

New York World Trade Center

"While we would like to think that all our practice and preparation would prepare us, nothing could have prepared us for what happened," said Charles Hargrove, ARRL New York City District Emergency Coordinator. "It was hard to prepare for something like this."

The New York City Office of Emergency Management (OEM), forced to move out of Building 7 at the WTC, used a bus. "They moved from corner to corner to corner as an event would happen, such as a fire," Hargrove said. This was the first opportunity for amateur radio to help. OEM needed phone lines for its command bus. Hargrove contacted the mobile command center and was told they needed five phone lines. He then contacted the telephone company, Verizon, and a technician was sent to "steal" phone lines to run out to different locations for OEM use.

Hargrove realized that the police and other agencies would be faced with monumental communications problems—starting with communications inside the first tower that was attacked. "The police and fire department knew the lines of communications were knocked out. They lost contact with their people above a certain point in the building due to [the destruction of] Radiax going up the building," Hargrove said. "You can tell from the radio broadcasts there was a lot of confusion." But then the second plane hit. "After the second plane hit, all heck broke loose."

Dispatchers found themselves inundated with calls for help and with warnings. "If you listen to the tapes of the police and fire activity you can hear the dispatchers trying to calm callers down so they could get a clearer picture of what was going on," Hargrove said.

In an effort to assist the authorities, Hargrove and his volunteers ran into a number of problems. "Communication with the OEM was poor," he said. "They moved twice and didn't tell us where they were going or how to contact them. This was very frustrating. I understand they get money from FEMA to support a RACES (Radio Amateur Civil Emergency Service) station. We have not seen a penny of it." Unlike the ARRL's ARES, which provides communications to civilian organizations, RACES provides communications to local and state government agencies with funding from FEMA. Also, Hargrove notes that getting the IDs for volunteers that federal officials required was tough going.

One thing Hargrove did not have a problem with was getting volunteers. "During the two weeks we were active, we had more than 250 people from not only New York, but also Pennsylvania, New England and New Jersey," Hargrove said. "We even had a couple of guys from Canada and a guy from San Francisco who were in the area volunteering."

Technical problems in New York were not as big of an issue as they were for the amateur radio volunteers at the Pentagon. One reason was the infrastructure that New York City amateur radio operators had in place. "We often take old stuff, like old taxi cab systems, and make them work. The old stuff is easily fixed or replaced," Hargrove said. "We have repeaters all over the city—in houses, offices, anywhere we can get one placed. In fact, one club was given space on top of a hospital. They are all individually owned. Not one is owned by ARRL."

—Roger Lesser

INTELLIGENT MICROPHONES

The Environment Changes. Now Your Microphones Can, Too

The days of simply placing microphones are over. To get the clearest, most natural, most dependable audio in a moving environment, a microphone system must do more than simply capture sound.

We're the experts when it comes to combining acoustics with signal processing and RF. We can deliver a precision solution that will adapt to change. That will isolate zones, reinforce speech, and defeat ambient noise. That will provide clear and worry-free communications for your vehicular, base-station, and on-person needs.

In the Great Outdoors, things are always changing. Give us a call and we'll help create a microphone system that will keep up. Because in mobile communications, the only true constant is a need for clear and reliable audio.

SHURE™
COMMUNICATIONS INC

1676 BARCLAY BOULEVARD
BUFFALO GROVE, ILLINOIS 60089
847.353.3100
WWW.SHURECOMM.COM

AEROSPACE AUTOMOTIVE LAND MOBILE MARINE TRANSIT

©2001 Shure Communications Inc. Shure Communications Inc. is a wholly-owned subsidiary of Shure Incorporated, the world leader in isolating, capturing and reinforcing sound.

CIRCLE (16) ON FAST FACT CARD

Photo courtesy of M/A-Com Wireless Systems.

Scotty Birtell was one of ten M/A-Com technicians who tested and programmed the 500 radios needed to aid in rescue operations in New York.

were cut by the collapse, which also disrupted radio communications.

The New York State Police coped by moving some of its radio operations into the Chrysler Building. Using a five-channel 800MHz trunking system rushed to them by M/A-Com Wireless Systems, the NYSP connected four antennas and a combiner left over by previous tenants to get this replacement "up and running by the evening of the [Sept.] 12," said NYSP dispatcher Sergeant Bob Jones last fall. M/A-Com also supplied 200 M-RK handheld transceivers for the state police. Jones has been unavailable since then for further comment.

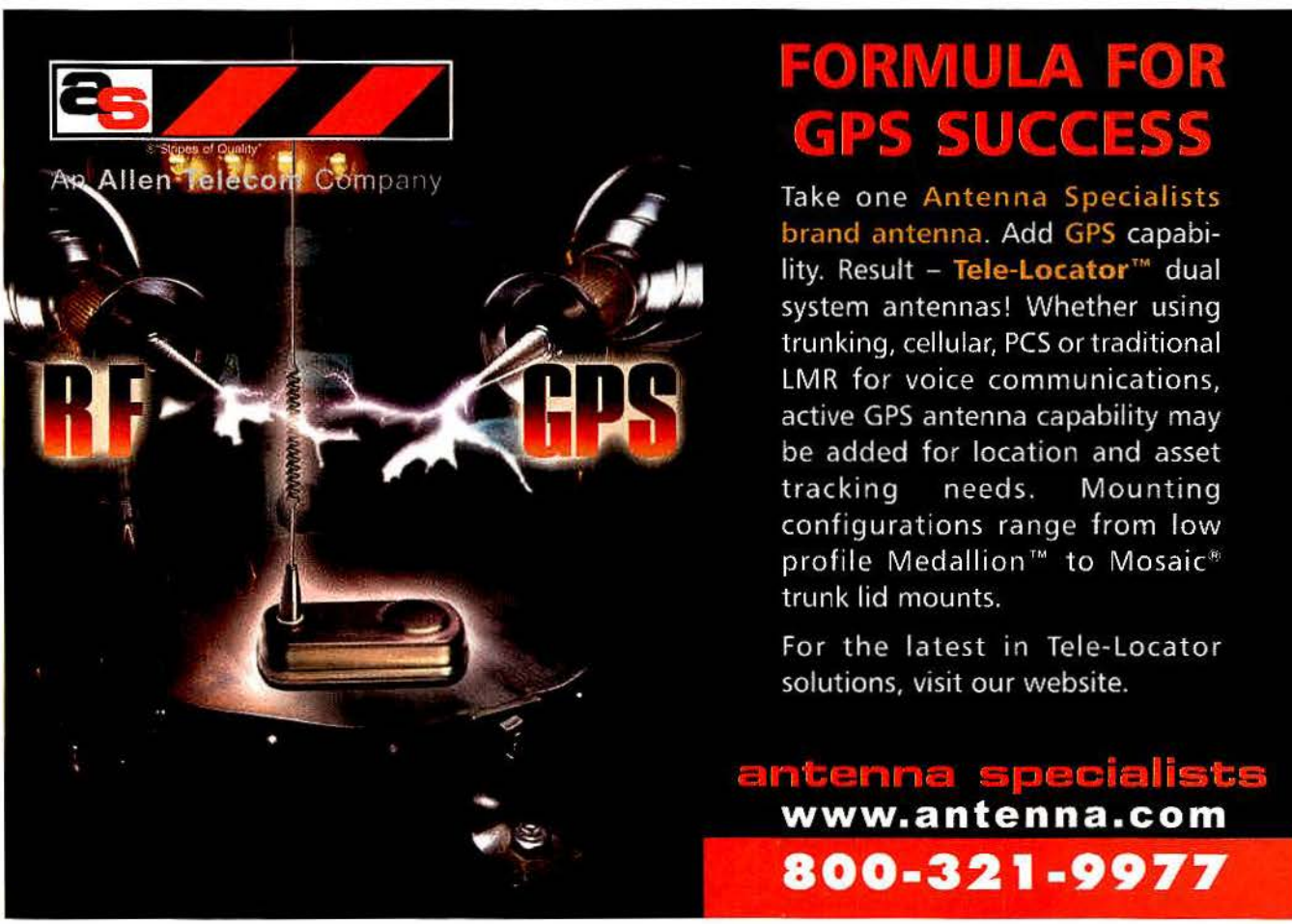
Finally, M/A-Com also helped the Port Authority set up a replacement command center in an unspecified location, using M/A-Com equipment shipped from Virginia. Together with the loan of 300 M/A-Com LPE hand-held transceivers, the replacement equipment restored the Port Authority's radio communications coverage within a day of the attack.

Even with the site replacements and substitutions that New York's rooftop managers provided, nothing fully replaces a 1,368-foot antenna site other than another 1,368-foot site.

What happens next

The trouble is, another 110-story structure is not likely to be built in New York. There would be too many bad memories associated with the previous colossal structure. Moreover, it could be impossible for most businesses to feel comfortable in a new WTC that might be an attractive target for terrorists.

Thus, the "temporary solutions" adopted by many NYC public safety networks may prove to be permanent. Whether the replacement facilities provide coverage as well as the World Trade Center did—or at least as well as is needed—will be revealed by the results of the next few months of use. ■



CIRCLE (17) ON FAST FACT CARD

MASTER of MANY...

Public Safety

Our radio dispatch, E9-1-1 telephone, TDD, IRR, and fire alerting systems help police, fire, and emergency medical agencies save lives and protect property around the world.

Mobile Radio

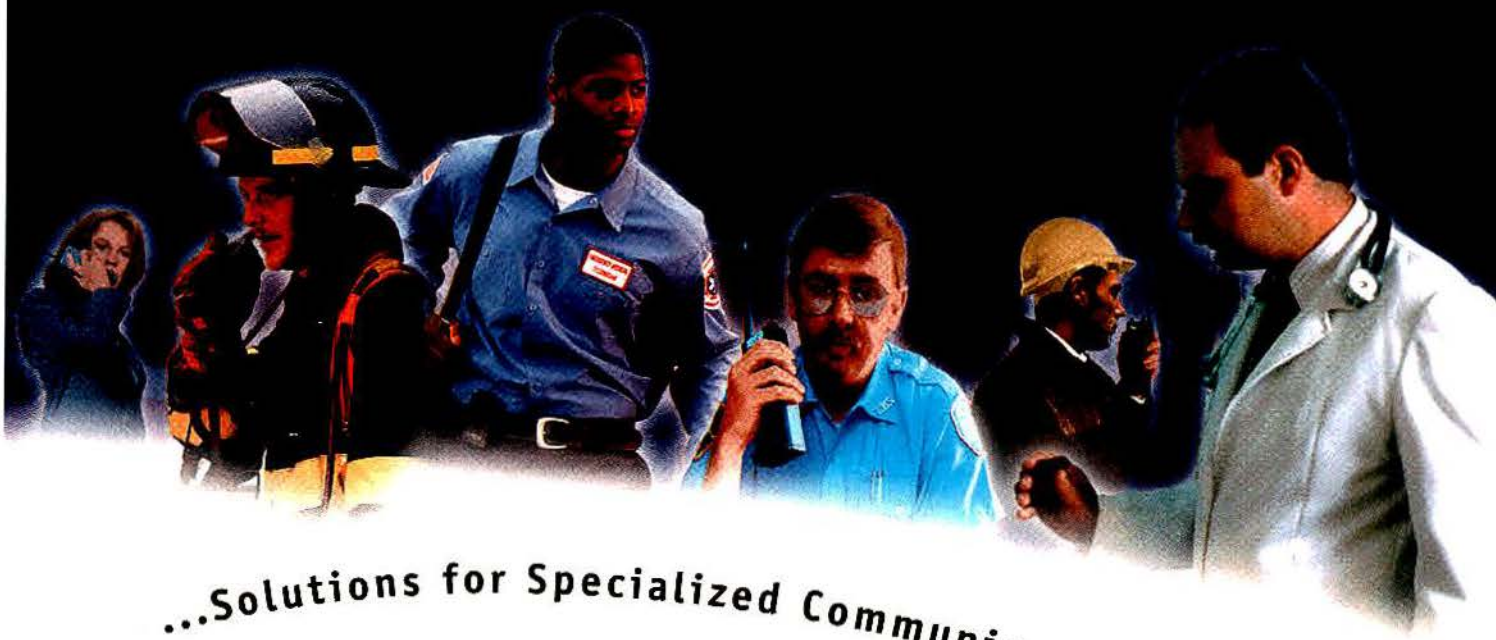
Customize a radio-telephone network for organizations such as utilities, healthcare, airports, campuses, and forestry that ensures complete control and security.

Paging Networks

Wide-area paging network for service providers and scalable on-site paging systems ensure a perfect fit for hospitals, hotels, casinos, and factories.

Wireless SCADA

As total systems or updates to multi-vendor systems, our Wireless SCADA, Telemetry, and Alarm Processors are ideal for waste/fresh water, oil/gas, and electric utilities.



...Solutions for Specialized Communications.

Zetron is a master when it comes to providing highly-reliable, easy-to-use, and reasonably-priced communications systems.

Many users in diversified applications recognize our commitment to quality products and superior service.

Small and large organizations around the world trust and respect Zetron. You can too!

Call today for your set of Zetron Product Guides.
Learn about solutions that support your business.

CIRCLE (18) ON FAST FACT CARD

ZETRON, Inc.
Internet: http://www.zetron.com
Phone: 1-425-820-6363 Fax: 1-425-820-7031
PO Box 97004, Redmond, WA 98073-9704 USA
Email: zetron@zetron.com

European Office:
Phone: +44 1256 880663 Fax: +44 1256 880491
27-29 Campbell Court, Bramley, TADLEY,
Basingstoke, RG26 5EG, UK

ZETRON®

Intermod: Getting the upper hand (Part 1)

By Harold Kinley

For those who haven't yet been initiated into the world of intermodulation interference, this will serve as a quick introduction, or it will simply serve as a basic review for the "old salts" who have been around for a while.

Intermodulation interference has always been a problem for those who work in the land mobile radio industry. In *channelized* communications systems, *odd-order* intermod products (resulting from *in-band* signals) will fall back into the same band.

Intermod can be predicted and calculated mathematically. There are many software applications ranging from commercial software to *shareware* and even *freeware*, that can be used to study the intermod phenomenon through mathematical analysis.

The requirements for the formation of an intermod signal are a non-linear mixing point and at least two signals (of different frequencies) applied to the non-linear mixer. The non-linear mixer can be the Class C RF amplifier output stage of a transmitter, an overloaded receiver input stage, a rusty point of a tower or a bad RF connector. In short, almost anything can become a non-linear mixer.

When dealing with large signal levels the mixer doesn't have to be highly efficient to produce an intermod signal of sufficient intensity to cause serious interference to an on-site receiver.

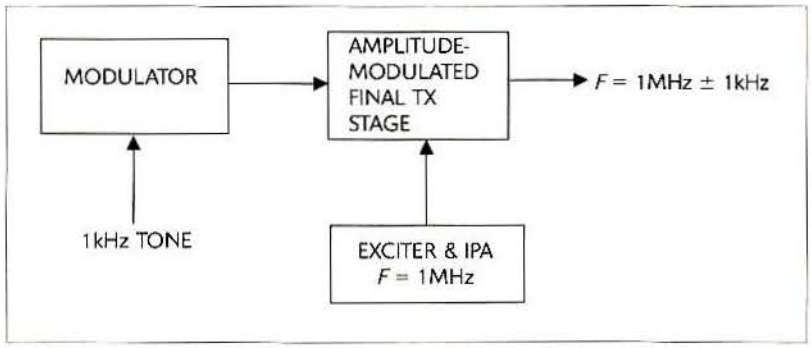


Figure 1. The intermodulation process in the modulated final stage of this AM transmitter from three signals at the output—the 1MHz carrier (F_c), F_c + 1kHz and F_c − 1kHz.

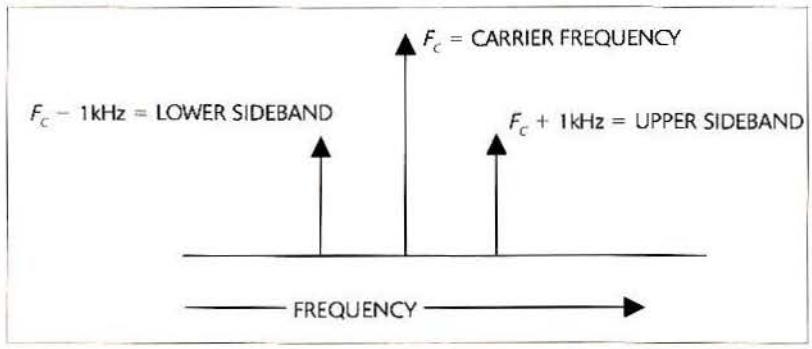


Figure 2. The process of amplitude modulating a carrier is produced by intermodulation. Here, the lower sideband is displaced below the carrier by a frequency separation equal to the frequency of the modulating tone. The upper sideband is displaced above the carrier by a frequency separation equal to the frequency of the modulating tone.

Figure 1 is a simple diagram of a plate-modulated AM transmitter. When a 1kHz sine-wave audio tone is applied to the input of the modulator, the signal is mixed with the RF carrier in the modulated stage to produce a sum and difference frequency of $F_c - F_a$ and $F_c + F_a$. If the carrier frequency is 1MHz (1,000kHz), then the difference frequency will be 999kHz and the sum frequency will be 1,001kHz.

Thus, the output from the transmitter will be the carrier frequency of 1,000kHz and the sum and difference frequencies (sidebands) would be spaced 1kHz above and below the carrier frequency. (See Figure 2.) These sidebands contain the *intelligence* of the signal and are the result of an intermodulation process.

Intermodulation occurs in a superheterodyne receiver where the local oscillator and RF signal are mixed to form an intermediate frequency. So, intermodulation isn't always a bad thing. Without intermodulation, our communications equipment wouldn't work. Yet, when *undesired* intermodulation occurs, it can cause our communications equipment to *not* work.

Odd-order intermod

Let's look at a channelized land mobile radio band where the channel spacing is 30kHz. (See Figure 3.) Here, seven frequencies are listed from a mobile radio band. Let's plug a couple of these frequencies into the third-order model: $2A - B$.

Contributing editor Kinley, *MRT's* technical consultant and a certified electronics technician, is regional communications manager, South Carolina Forestry Commission, Spartanburg, SC. He is the author of *Standard Radio Communications Manual, with Instrumentation and Testing Techniques*, which is available for direct purchase. Write to 204 Tanglewylde Drive, Spartanburg, SC 29301. His email address is *halkinley@charter.net*.

Representing tower and rooftop owners in site leases, ground leases, management agreements, easements, and other site contracts since 1984.

- FCC Application Preparation
- Channel Brokerage and Sale
- Tower Leases and Site Rental Agreements
- Contract Preparation and Negotiation
- Litigation, Including Harmful Interference Complaints
- FCC Auction Representative
- Buy/Sell Agreements are our specialty.

Call us before you phone the broker and let us steer you to higher returns.

SCHWANINGER & ASSOCIATES

– We make the difference in the deal –

SCHWANINGER & ASSOCIATES
ATTORNEYS AT LAW

1331 H Street, N.W., Suite 500
Washington, D.C. 20005
(202) 347-8580

www.sa-lawyers.net

CIRCLE (19) ON FAST FACT CARD

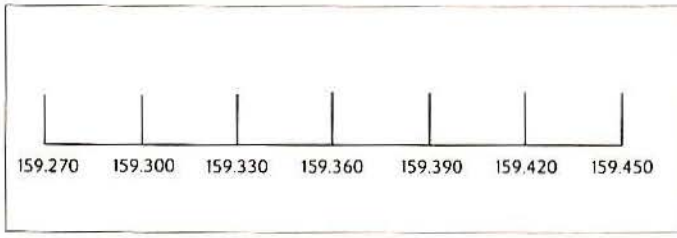


Figure 3. A few frequencies from a land mobile radio band are shown here. Odd-order intermod signals formed from any of these frequencies will fall back into the band. Even-order intermod signals formed from frequencies within this band will fall out of this band.

If we let A = 159.390MHz and B = 159.360MHz, then the resulting intermod frequency will be 159.420MHz. So, it falls right back into the band and will cause interference to a receiver on this frequency and near this site. This is called third-order intermod because the sum of the coefficients of the *mixed* frequencies is equal to 3.

Let's try a fifth-order product in the form of $3A - 2B$ where A is 159.330MHz and B is 159.300MHz. Then, $3(159.330) - 2(159.300) = 159.390$. Again, the odd-order intermod falls back into the same band where it was generated. The odd-order intermod products are the most troublesome in land mobile radio—especially those of the third order.

Even-order intermod

Even-order intermod caused by *in-band* frequencies will fall out of band. Referring again to Figure 3, let's plug a couple of these frequencies into the even-order model $A - B$—a second-order intermod signal. In this example, let A =159.450 and B = 159.300. The resulting intermod signal is 150kHz and falls far out of band. This results in no interference to any of the in-band channels.

The rule

The rule that says odd-order intermod products fall in-band while even-order intermod products fall out of band is true as long as the frequencies forming the intermod are in-band frequencies. If the frequencies are from different bands, this statement no longer holds true.

Next month we will look at practical examples of intermod and how they can be resolved by taking advantage of the "leverage" factor. Until next time—*stay tuned!* ■

CIRCLE (20) ON FAST FACT CARD

The *i*-WLL TRAILBLAZER

Get Full Wireless Voice and Data Communications to Your Remote Site - Quickly, Reliably and Cost-Effectively - with:

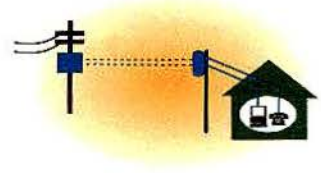
- **Ranges in Excess of 22 km/14 Miles***
- **License-Free 2.4 and 5.7 GHz Bands**
- **Data Rates up to 256 kbps**
- **Crystal-Clear Voice**
- **Self-Contained, Self-Configuring**

COMPACT SIZE
8.5 X 10.5 X 5 in.
weatherproof

Four *i*-WLL Trailblazer Models:

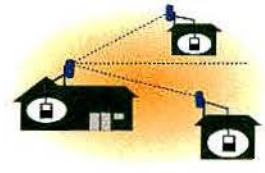
Phone Line Extender

Extends two full-service telephone lines and one data port up to 14 miles.* Supports wireline-quality V.90 dial-up, and RS-232/422 or V.35 interfaces at speeds up to 128 kbps for internet and/or fax.



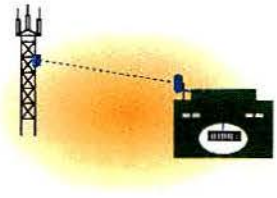
Ethernet Bridge

Connects to and extends existing WAN/LAN networks to other sites in excess of 8 miles line-of-sight distance.* Can also provide wireless broadband Internet and Internet telephony to remote clusters.



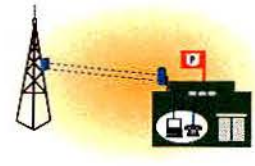
Fractional T1/E1

Transmits V.35 synchronous data for use as a line concentrator with multiplexed voice, or simply for extension of any private network, with data rates as high as 256 kbps! Uses only 2 watts, and costs less than the competition.



Leased Line Emulator

Establishes a dedicated analog connection between two sites within 14 miles line-of-sight distance.* Provides two full duplex, two-wire or four-wire lines.



**ranges can be extended using an optional external antenna.*

All models offer:

- **Plug-and-play simplicity.**
- **Small, lightweight, easy to install and use.**
- **User-friendly graphic user interface.**
- **All components, including antenna, fully integrated into a weatherproof, lightning-protected enclosure.**
- **Very low power draw. Accepts any voltage from 12 - 48 VDC.**
- **Easily solar powered.**
- **Optional external antenna increases range.**
- **Repeaters also available.**

LEADING THE CHARGE ACROSS THE DIGITAL DIVIDE

CWT CARLSON WIRELESS TECHNOLOGIES, INC.
1180-B Evergreen Rd., Redway, CA 95560 USA
+1-707-923-3000 phone
+1-707-923-1913 fax
sales@carlsonwireless.com

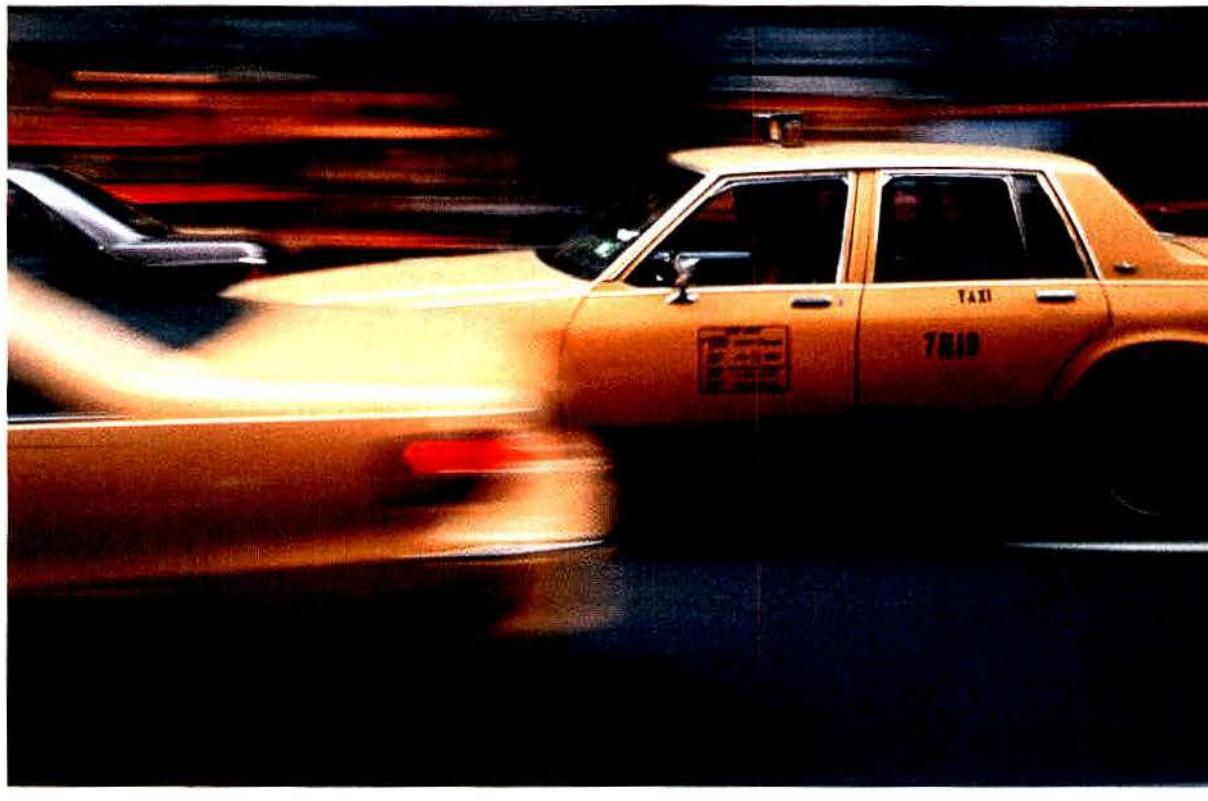
Much more on our website!
www.carlsonwireless.com

CIRCLE (21) ON FAST FACT CARD

Web-based dispatching for the bottom line

Combining dispatching with GPS offers business owners a powerful tool for managing fleet operations to bring down costs.

By Don Bishop



What do trucking companies, taxi companies, utilities, couriers, police departments, fire departments, ambulance services and parents with teenagers have in common? They want to know where their vehicles are.

Here's the difference, though: The vehicle location service has to be configured and priced just right for each kind of user.

For example, many trucks travel interstate on lengthy journeys. Dispatchers need to know where they are, but not every minute. Private radio systems don't have the necessary coverage, so satellite or cellular systems provide the mobile communications link.

The vehicle location service has to be configured and priced just right for each kind of user.

Taxis, utilities and couriers often have their own radio networks or buy airtime from service providers that can supply or carry vehicle location information. These customers often need more frequent updates that can run up the cost.

Police, fire and emergency medical services need real-time location information, and they need the reliability of their own dedicated network or a data allocation on a public network.

And parents? Well, as much as they might like to know where their teenagers have driven the family car at any given moment,

Bishop is editorial director. His email address is *dbishop@primediabusiness.com*.

REAL VALUE
IS MORE THAN JUST PRICE

At Kenwood, real value begins with honoring commitments. For us, it also means offering products with high quality and unparalleled performance, at a fair price. And in this business, providing real value also means continual innovation. So, when the next step is digital technology, Kenwood is your choice for real value.

Backing our technology commitment is our nationwide network of authorized dealers who will offer digital technology like P 25 radios. Kenwood digital offerings, combined with our complete line of analog product, means that your communications needs are met now and in the future. In the coming year, Kenwood innovation will bring you new products that both meet our standards and match the market's evolving requirements.

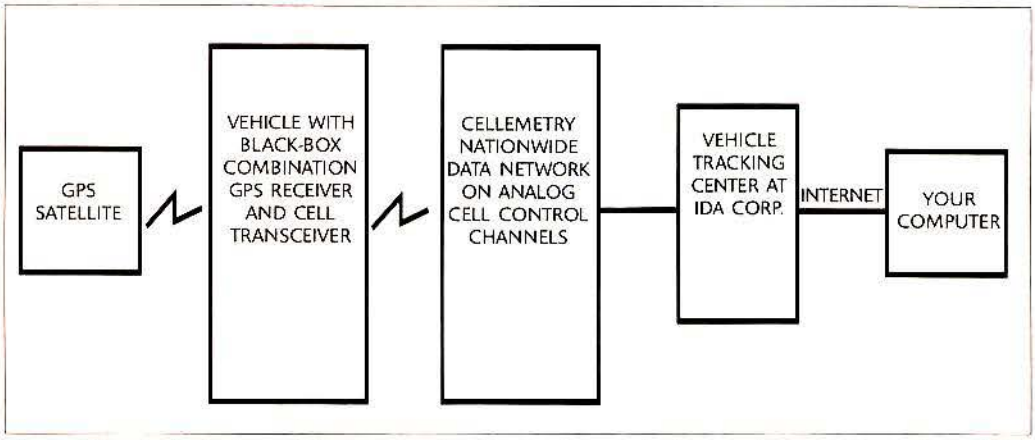
We know you have an unlimited need for quality and reliability. Trust Kenwood and our proven commitment to real value.

KENWOOD
COMMUNICATIONS

PLEASE VISIT US AT IWCE BOOTH 12001

1-800-950-5005 www.kenwood.net

CIRCLE (22) ON FAST FACT CARD



The tracking device in the vehicle captures locations and transmits data packets over the analog cellular network's control channel on the Cellemetry network to IDA's data tracking center. The information is accessed either by an Internet browser or Web-client software.

the cost may be too high. But it's relatively economical to feed location information into a vehicle-mounted recorder for daily or weekly review to see where a car has been.

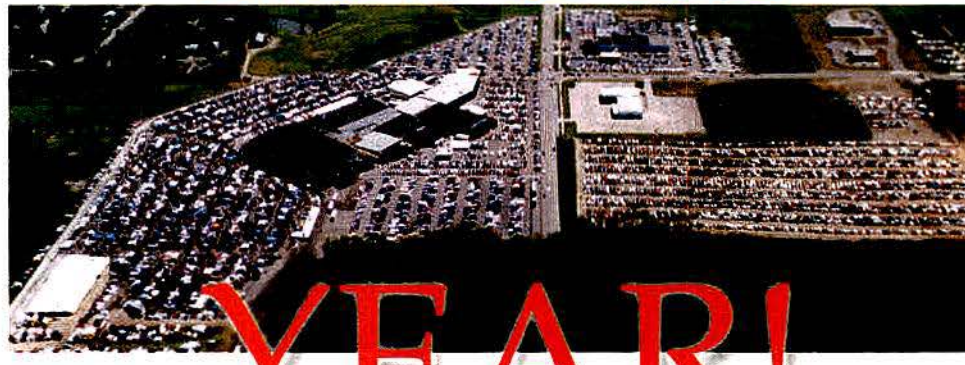
A combination of GPS, cellular and Internet products offers Web-based vehicle location service for over-the-road trucking. The three technologies come together to bring the cost down compared to the satellite services that trucking companies have used for many years.

In the vehicle, a black-box unit that combines a GPS receiver with a transceiver designed to communicate on cellular system control channels sends the truck's position over cellular system control channels using an arrangement with cellular carriers fashioned by Atlanta-based Cellemetry, a subsidiary of Numerex.

Cellemetry's technology transmits short messages via the control channels of the AMPS cellular network. The AMPS cellular network has 790 analog voice channels and

Vendor & Exhibitor Spaces Still Available! Call Today! 937-276-6930

THE HAM RADIO EVENT OF THE



YEAR!

May 17, 18 & 19, 2002 • Hara Arena • Dayton, Ohio

3 days. Over 1600 Exhibitors & Vendors. Unsurpassed Outside Vending Area.
Special emphasis on Emergency Communications. Call today for more information!
937-276-6930 • www.hamvention.org • 1-800-491-4267 (hams)

HAMVENTION

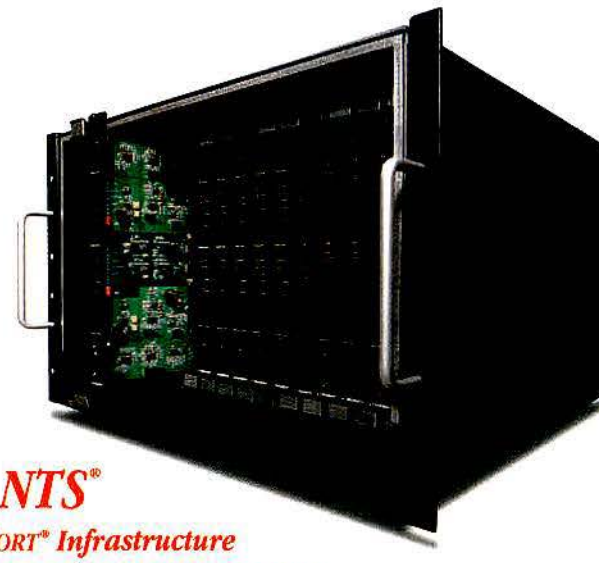
CIRCLE (23) ON FAST FACT CARD

In 1999 it was Revolutionary. Today, it's an Industry Standard.

The Trident *NTS*® platform is the heartbeat of the *PassPort*® trunking protocol, the recognized networking standard for the industry. *PassPort*® subscriber units are available in more bands and from more manufacturers than any other networking standard.

Trident Micro Systems, the pacesetter in the race towards wide area networking, announces *NTS*® and *PassPort*® support for 217-222 MHz, 700 MHz Guard Bands as well as VHF, providing new spectrum opportunities for network operators.

Come by our booth at IWCE 2002 and find out what new idea from Trident today will become the industry standard for the future.



NTS®
PassPort® *Infrastructure*
from Trident Micro Systems

TRIDENT
MICRO SYSTEMS

Two Trident Drive, Arden, NC 28704 • (828) 684-7474 • (800) 798-7881 • Fax (828) 684-7874 • www.tridentms.com • Booth #11017

CIRCLE (24) ON FAST FACT CARD

42 digital control channels. The control channels initiate cellphone calls. Once the call is initiated, the cellular system directs the telephone call to a voice channel.

The control channels are more robust than the voice channels for several reasons. First, the control channels are digital; the voice channels are analog. The control channels also operate at higher transmission power than the voice channels, giving better coverage. Finally, the cost of using the control channels is far less than the regular voice channels.

Vehicle-tracking software shows reported locations of multiple vehicles on the same digital map.

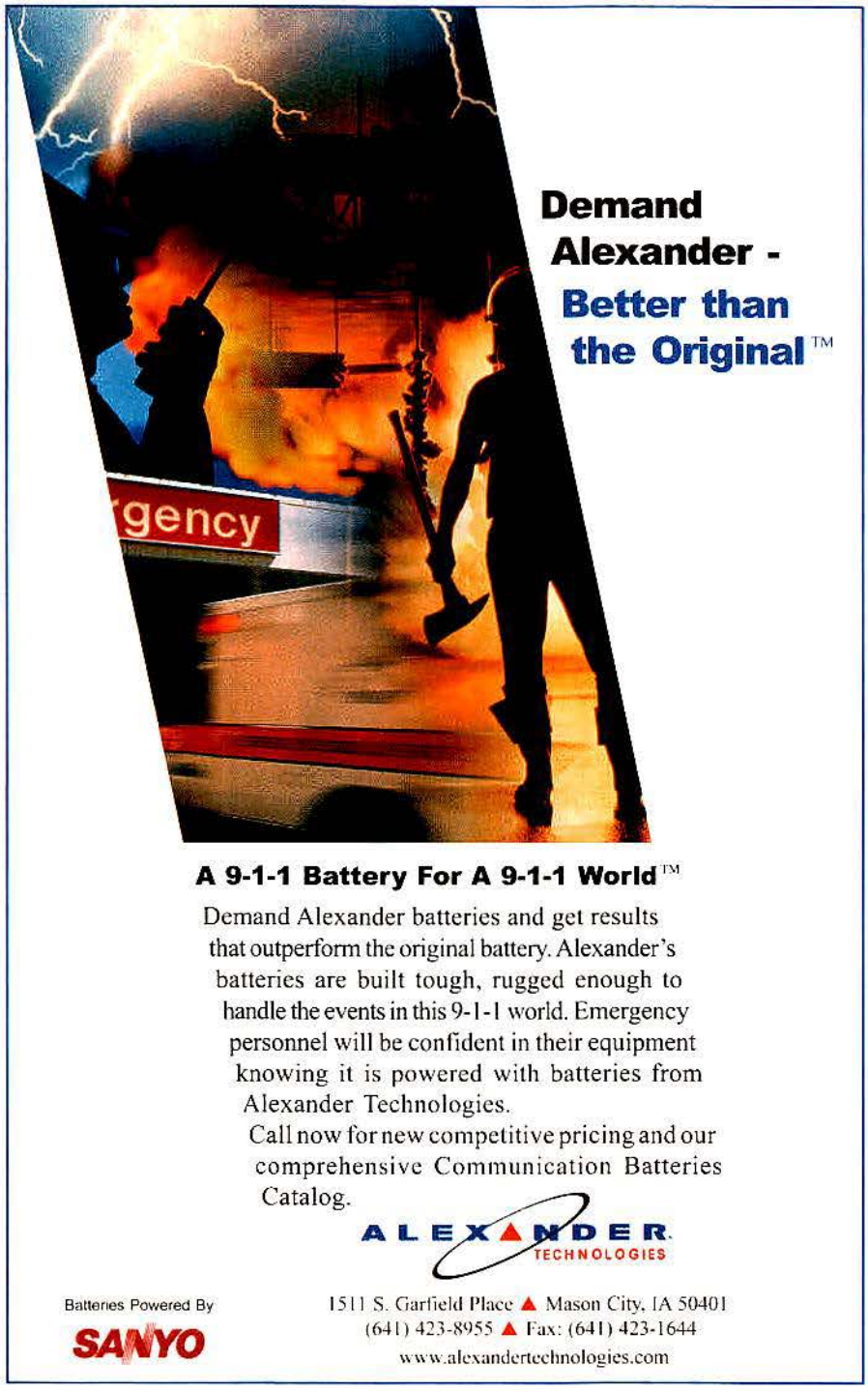
By using the cellular network, Cellemetry takes advantage of a proven technology used by millions of cellular users and available virtually everywhere. The analog cellular network is the biggest radio network in the world, and some 200 million packets of data are transmitted over the control channels every day in North America. This represents an average of only 10% of the maximum control channel capacity.

Cellemetry operations

The Cellemetry service operates in the same manner that roaming telephones operate in the cellular system. A roaming telephone is defined as a cellphone operating in any system other than its home system. When a cellphone is turned on outside of its home system, it sends its mobile identification number (MIN) and its electronic serial number (ESN) to the cellular system via one of the control channels.

Based on the cellphone number, the local cellular switch communicates with the "home system" of the roaming telephone. It uses the SS7 network that interconnects all cellular switches in North America to confirm that the user is allowed to use the system and which phone-calling features are available to that customer.

The Cellemetry radio, like a roaming cellphone, sends an ESN and MIN number over the SS7 network, but the MINs are specifically assigned so the MIN and ESN are routed to a Cellemetry service gateway that is also connected to the SS7 cellular network. The MIN serves to identify the Cellemetry



CIRCLE (25) ON FAST FACT CARD

We deliver **unbelievable performance** in places you wouldn't believe.

With more than 30 years experience as a world leader in coaxial cable innovations, CommScope Wireless™ offers a broad array of cable solutions for wireless applications - including mobile, fixed and in-building wireless networks. CommScope Wireless provides advanced coaxial, twisted pair and fiber optic cable technology to create a network that provides wireless access anytime, anywhere - at home, the office, and remote environments.

CommScope®
WIRELESS
How Intelligence Travels.

- ***Exceptional quality products***
- ***Superior reliability***
- ***Outstanding customer support***
- ***Competitive prices***
- ***Composite constructions***

NEW!

Extremeflex™ Get In Shape! Stay In Shape! Extremeflex 1/2" cables and factory assembled jumpers deliver reliability, performance flexibility and conformability. We now offer a Waterproof Warranty on 1/2" Cell Reach and Extremeflex factory assembled jumpers. Find out how Extremeflex can keep your wireless network system in great shape!

Cell Reach® is a complete line of cables, connectors and accessory hardware and tools designed specifically for wireless transmission line systems. Cell Reach offers unmatched performance and industry leading reliability.

WBC™ is a low-loss, low cost 50-ohm flexible cable designed for Land Mobile Radio, Paging, WLL, mobile, fixed wireless (LMDS/MMDS/MMWAVE) and in-building wireless networks (WLAN, etc.)

extremeflex

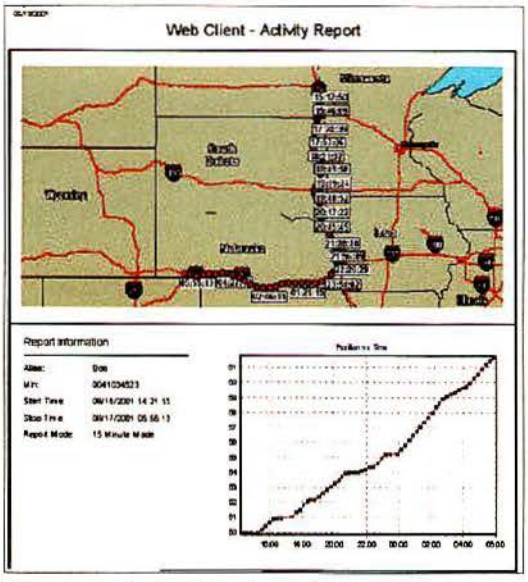
For more information:
1545 St. James Church Road
Newton, NC 28658
Toll Free 1-888-CELL-REACH (235-5732)
Tel. (U.S.): 1-828-324-2200
Fax (U.S.): 1-828-466-8617
wireless@commscope.com
www.commscope.com

Believe in CommScope.

We are how the world becomes wireless.

©2002 CommScope LLC of North Carolina. Cell Reach is a registered trademark of CommScope, LLC. How Intelligence Travels is a registered trademark of CommScope LLC

CIRCLE (26) ON FAST FACT CARD



Monitor and direct fleet activity on maps that can be customized with user landmarks and detailed information.

radio, and the ESN is the data field that contains vehicle location information.

The vehicle location information travels from the Cellemetry service gateway to a server at IDA, the black box supplier and vehicle location service provider in Fargo, ND. IDA makes the location information available to the customer via Internet protocol.

The system can be configured to send location information automatically every 15 minutes or every hour, and it can be polled or "pinged" at will to request location information. But it takes three to five minutes for the location information to travel from the vehicle through the cellular network, Cellemetry's gateway, and IDA's server and over the Internet to the customer. That's adequate for trucking company purposes, but not for public safety agencies.

The black box hardware costs about $600 to $700 per vehicle installed. The software package for tracking vehicles with Web-based browser access is free. Cellemetry charges a $25 activation fee, and $20 per month pays for 12 location readings per day.

Service plans with more readings per day are available. Location readings every 15 minutes cost $50 per month, for example. Customers can "ping" a vehicle's location for $1 per query.

The computer screen displays a map indicating the vehicle's location during the periodic readings or queries.

IDA's nationwide location system is fairly new, and is mostly being installed in over-the-road trucks. The company's other AVL products are based on business-

PRIMUS
ELECTRONICS CORPORATION

For a limited time only!
Order a minimum of 150' of RF-1/2" cable
or a minimum of 100' of RF-7/8" cable and at least
2 NK/Spinner connectors and you get the prep tool for FREE.

Valid March 15 to May 15, or while supplies last.
Quantities are limited, so call today!
Limit one tool of each type per customer (during promotion)

When placing your order please mention the following order code for your FREE prep tool.

RF-7/8" Order Code: NKC-NKA 1003 PRO
RF-1/2" Order Code: NKC-NKA 1001 PRO

Call today!
800-435-1636 (IL) 800-892-1413
Fax: 800-767-7605

www.primuselectronics.com

You have to use the right tool to do the job right. And with PRIMUS the tool is FREE.

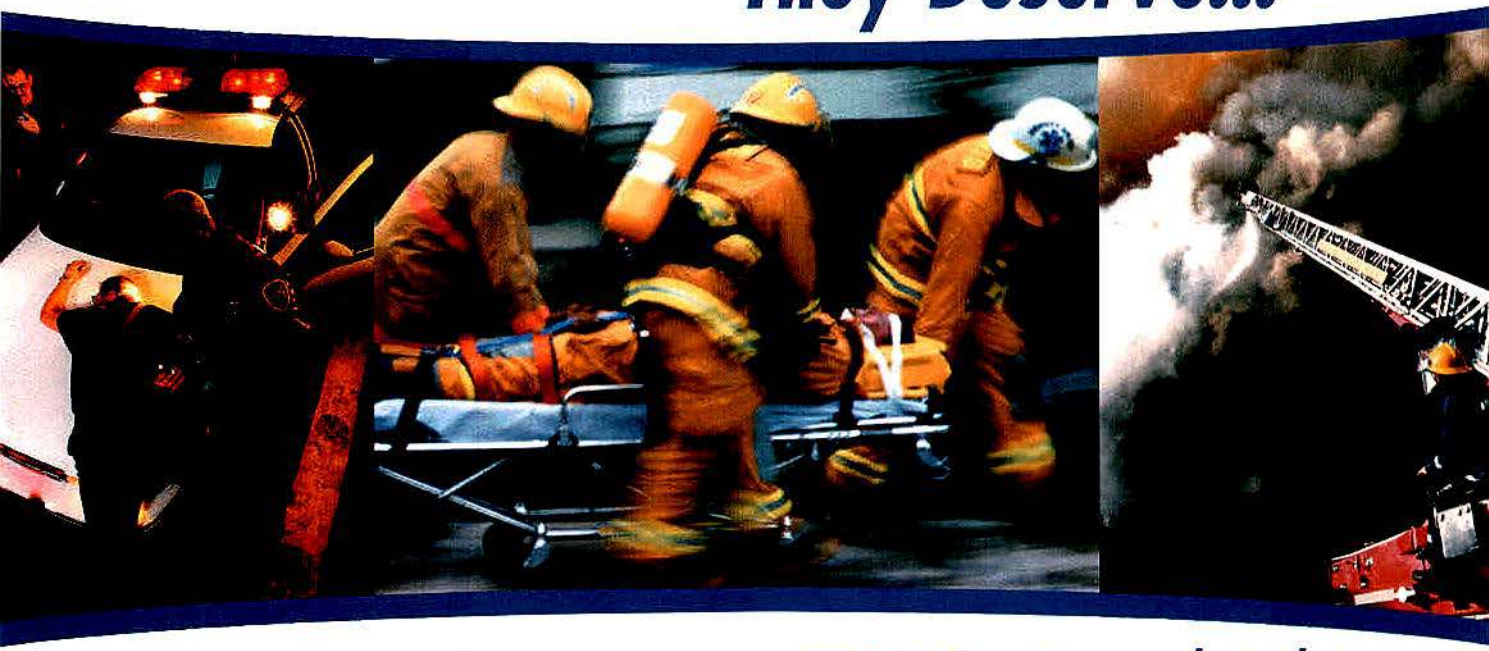
Tool Up For Free!

NK CABLES
Going to any length

PRIMUS
(National) 800-435-1636
(IL) 800-892-1413

CIRCLE (27) ON FAST FACT CARD

They Need Working Radios. They Deserve...



iQ ten

iQ five

iQ pac

iTech

...iTECH's iQ series - products that extend battery life, reduce battery costs and improve battery performance.

iQ ten - high-performance, time-saving battery tester

- Battery test and maintenance; bar code programmable
- LCD displays battery capacity and test data
- Computer interface tracks battery performance
- NiCd/NiMH/Li-ion/Sealed Lead
- Costs 30% less than nearest competitor!

iQ five - the mobile industry standard

- One touch battery test and maintenance
- NiCd/NiMH/Li-ion
- Affordable price, amazing value!

iQpac - personal analyzer charger/conditioner

- Analyzer/Conditioner with two-step programming
- Lock programs to prevent tampering
- NiCd/NiMH and Li-ion
- Saves you time (money) – field users can easily maintain their personal batteries
- A price that can put battery maintenance in the field!

30-day satisfaction guarantee
Three-year warranty
Made in the U.S.A.

See us at IWCE April 24-26 - Booth #15118
Call 800-233-6868 or visit www.itecheng.com today!

Copyright © 2001 Intelligent Technologies LLC, San Diego, CA, USA. iTECH®, iQ™®, iQ™® and iQpac® are registered trademarks of Intelligent Technologies LLC

CIRCLE (28) ON FAST FACT CARD

band radio or public safety radio applications that are more regional in nature.

For applications that do not require location information from vehicles as they move about, a GPS system can be placed in a vehicle, and its location recordings can be downloaded periodically to run in a program on a computer. Even more readings might be taken in this way because the buffer can hold 1,200 records.

For locating vehicles during their travel, the black box installed in the vehicle contains a GPS receiver and a cellular unit. A short "rubber duck" type antenna serves the cellular transceiver, and a magnetic-mount antenna serves the GPS receiver.

Use a Web browser to see a vehicle icon positioned on a digital map with the street address.

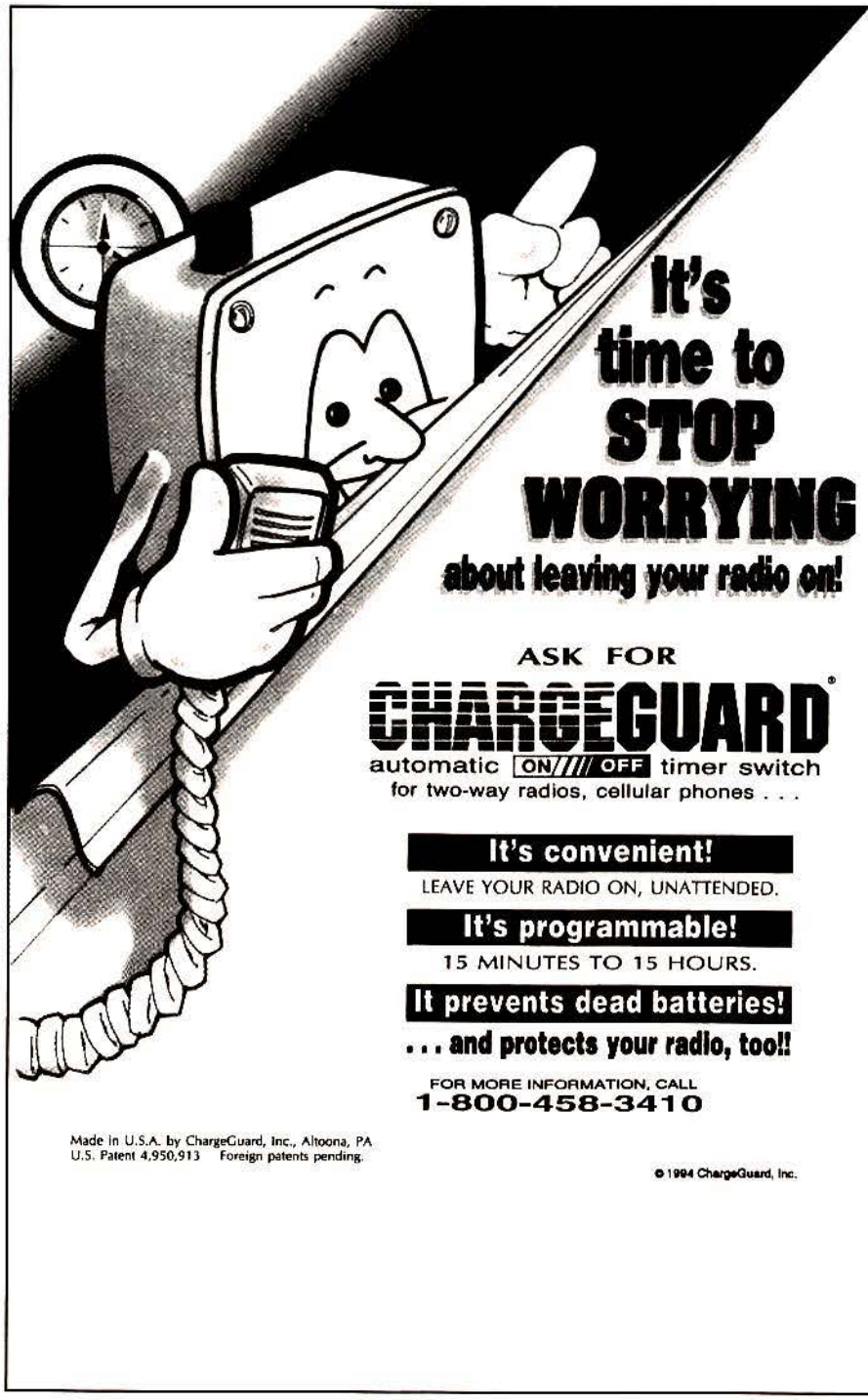
Although the GPS antenna has to have a good view of the sky, the box can often be mounted under the dash because the cellular antenna will receive through plastic and glass. If the box is mounted in the trunk or another inconspicuous position, the cellular antenna must be mounted outside the vehicle and connected to the box with a cable.

Public safety applications

A Web-based system of this type is not as popular with public safety users because location readings are delayed by a few minutes as the unit connects with the cellular network and the information travels across the Internet. When officers are involved in a high-speed chase, the dispatcher wants continuous and instantaneous position information. There is no way to provide that with Web-based software that has to route information through the Internet to IDA's server and from there to the customer's dispatching position.

Public safety agencies commonly use dedicated radio channels for mobile data. They purchase other equipment and software that allow them complete control of the AVL system.

But for delivery services that cover regional areas or a national footprint, no radio system other than cellular offers the necessary range. That's where Web-based AVL fits the bill for low-cost GPS dispatching. ■



CIRCLE (29) ON FAST FACT CARD

VISIT US AT IWCE, BOOTH #17027

Our Systems Perform In Mission Critical Environments Every Day.

As a leader in the communications industry, Avtec has consistently pushed the threshold of technology. Since lives depend on the functionality of our systems, reliability has always been imperative. In fact, the architecture used in our communications console systems has a proven availability of 0.9999891. This reliability has been demonstrated in over 250 dispatch centers worldwide.

Our true multi-line, multi-operator console systems can support from 32 up to 4,096 circuits and up to 512 console positions and is based on our unique DSPatch system architecture. You get real-time voice processing with virtually no downtime – and a robust, fully redundant switch, including audio paths, data paths, and power. Our modular equipment and Graphic Maintenance Utilities allow you to add features or expand capabilities as your needs change. And our user-friendly systems require very little training.

Avtec is familiar with your mission critical environment, because the systems we build are designed for exactly what you do. For more information, call 803.892.2181 or email sales@avtecinc.com today.

Avtec

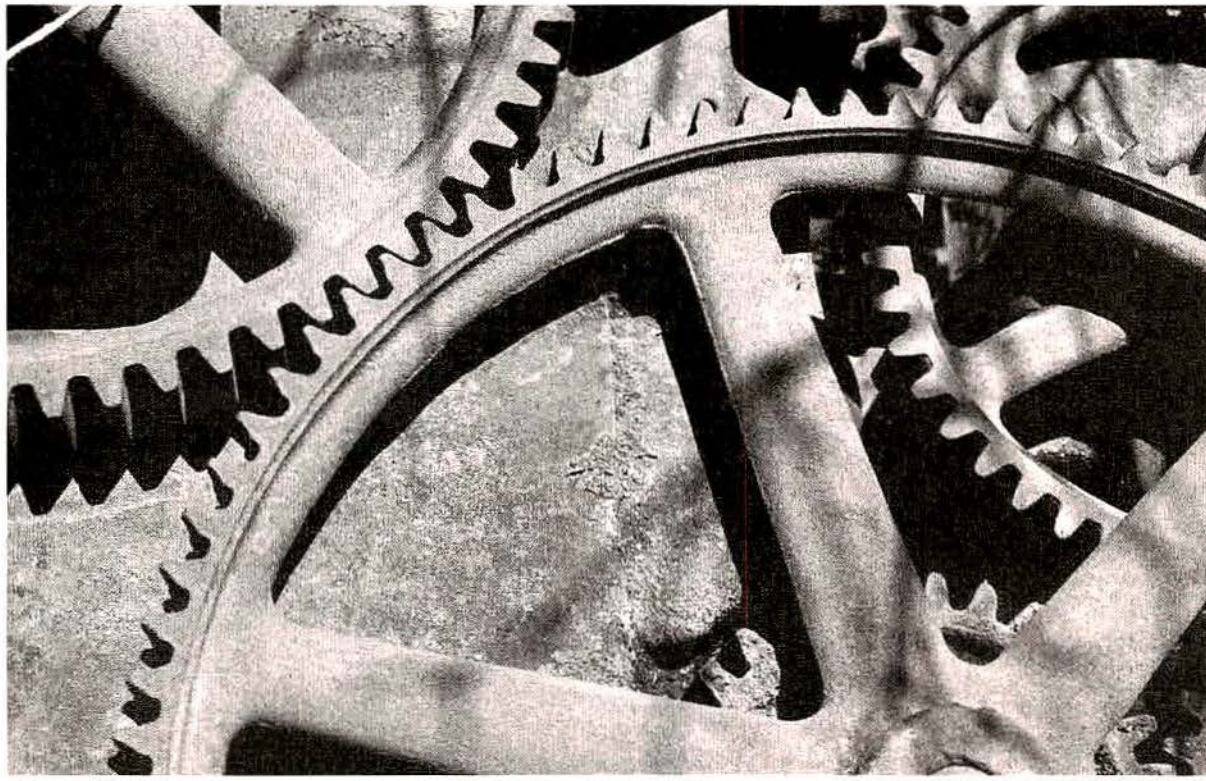
4335 Augusta Highway
Gilbert, South Carolina 29054 USA
Telephone: 803.892.2181
Fax: 803.892.3715
Website: www.avtecinc.com
© 2000, Avtec.

CIRCLE (30) ON FAST FACT CARD

The pursuit of interoperability

Interoperability *can* be accomplished through several methods. Public safety agencies must identify options and make the most feasible choice—temporary or permanent.

By Peter Pflasterer



Safety of life and property can only be assured when public safety agencies can *easily* communicate with one another. All too often, the different systems they use preclude them from communicating at all. Agencies must have high-quality, interoperable communications at their disposal to ensure effective and timely coordination of disaster responses. Recent high-profile incidents, coupled with the events of Sept. 11, have drawn into sharp focus the need for voice radio interoperability both for routine day-to-day use and during emergencies.

What is interoperability?

A good definition of interoperability can be found on the Advanced Generation of Interoperability for Law Enforcement program Web page (**www.agileprogram.org**): "Interoperability is the ability of two or more parties (e.g., public safety agencies) to exchange information, when and where it is needed, even when disparate communication/information systems are involved. Information may be exchanged among fixed facilities, mobile platforms and portable (personal) devices."

Providing interoperability

To be most effective, interoperability needs to be available for daily operations and for emergency use. Additional considerations include suitability for disaster sites as well as fixed-station use, ease and speed of deployment, central control capability, network capacity of the system and cost. Communications interoperability can be obtained with:

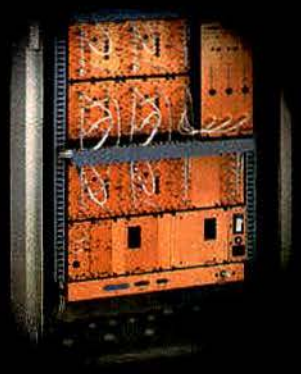
Consoles — Communications consoles in many LMR systems can interconnect different agencies' radio channels. This can provide day-to-day interoperability, but console operators can become quickly overloaded during emergencies. Additionally, only those agencies whose channels are accessible through the console can be interconnected, precluding important agencies whose participation

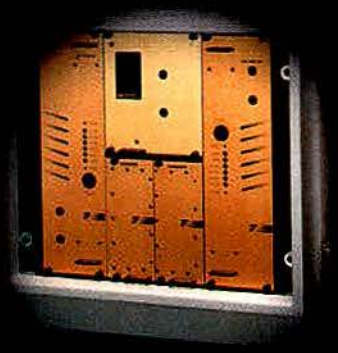
Pflasterer is president of JPS Communications, Raleigh, NC.

broad-band amplifiers

vehicular repeaters

channel-selective repeaters



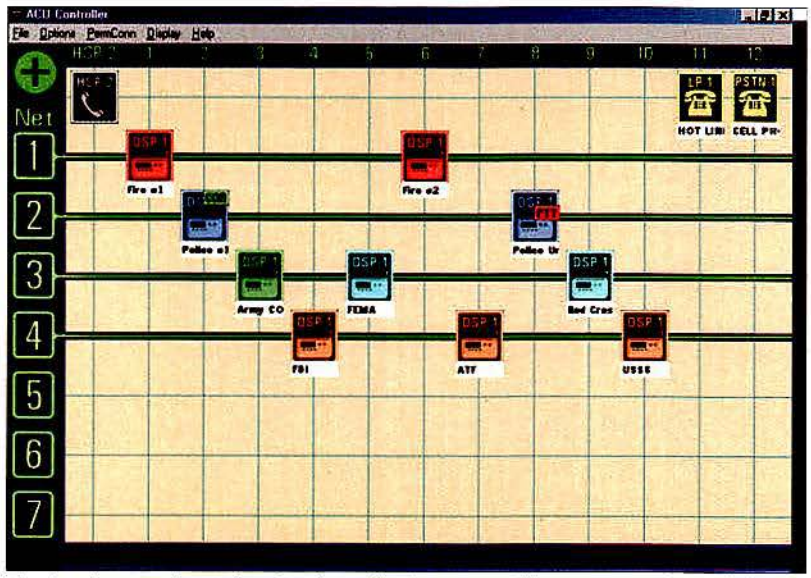


www.FUTURECOM.com

RF coverage by design

1-800-701-9180

CIRCLE (31) ON FAST FACT CARD



The implementation of a simple radio interoperability system using the ACU-1000 Gateway from JPS Communications. City police, fire and state police can communicate with each other through the gateway when needed. Cross connections between radio channels can be established and broken by an operator at the computer terminal or via DTMF signals from radios in the field.

is crucial during emergencies, particularly agencies that are brought in to deal with specific situations.

Mutual aid channels — Many city and county LMR systems have a mutual aid channel available that is useful for daily interoperability. Disadvantages for emergency use include difficulty of usage coordination and the fact that field radios may not contain the mutual-aid channel. Only those agencies with access to the mutual-aid channel can be interconnected, which can leave out important agencies whose participation is needed during emergencies.

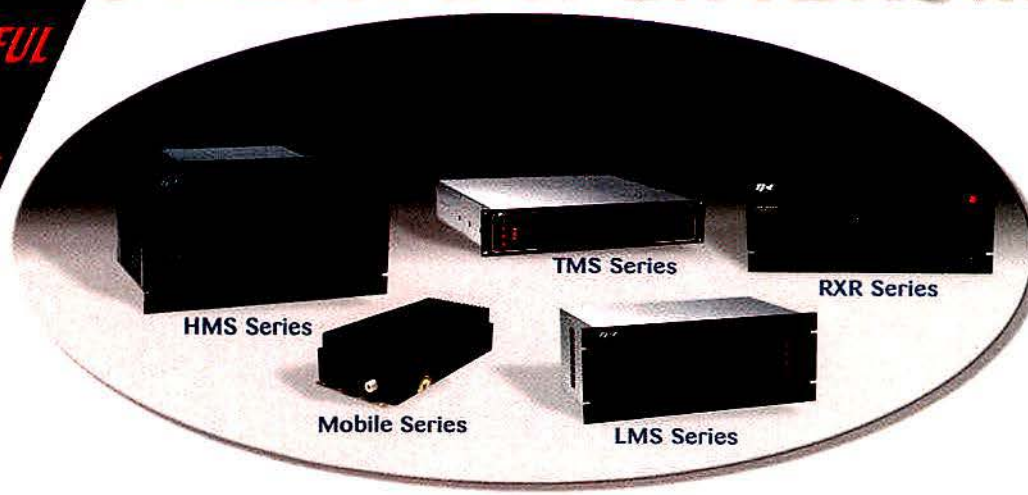
Collocated communications devices — Interoperability may be handled at the scene of a disaster by an officer operating a number of different radios while relaying messages between radio channels. Although inexpensive and

...RF POWER AMPLIFIERS...

POWERFUL

RELIABLE

AVAILABLE



TPL Communications is known around the world for the most reliable, top performing amplifiers on the market today. TPL offers four different continuous duty amplifier models to meet your needs with power levels up to 500 Watts. TPL also offers a broad line of mobile amplifiers. All are available in VHF Low Band, VHF High Band, UHF and UHF High Band (806 to 960 MHz).

TPL also knows that you need amplifiers designed to fit your needs and we are ready to build to your specifications.

www.tplcom.com

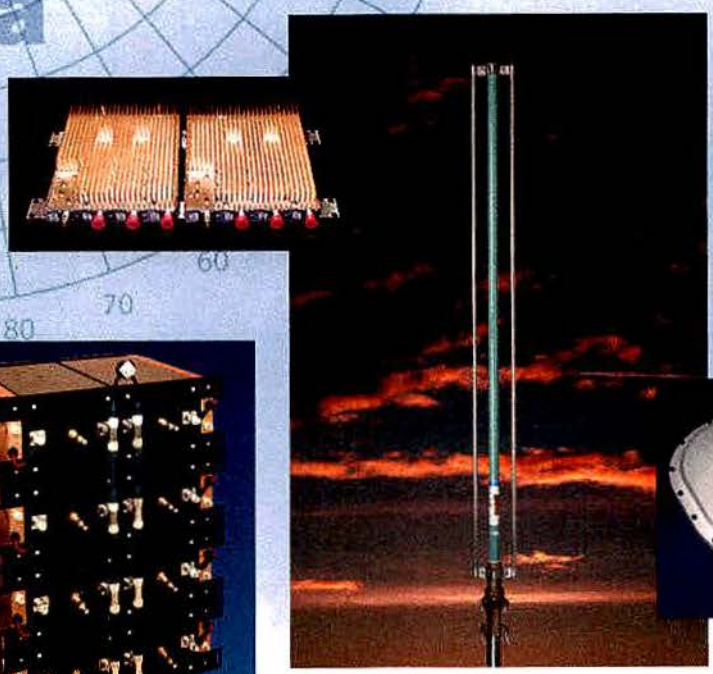
Visit Us At The IWCE Show at Booth15009

Leadership by tradition. TPL COMMUNICATIONS

CIRCLE (32) ON FAST FACT CARD

Decibel Products

A World of wireless solutions.



Decibel Products is the worldwide choice for quality **antennas**. Whatever your needs: Trunking, PCS, Cellular, Paging, GSM, Broadband or Indoor, you'll find the solution at Decibel.

Decibel also offers a complete array of site management products. From combiners and duplexers, to tower mounted amplifiers, to quality cables connectors and jumpers ... Decibel Products has a world of possibilities.

For more information, please visit our website at www.decibelproducts.com or call customer service at 800.676.5342.

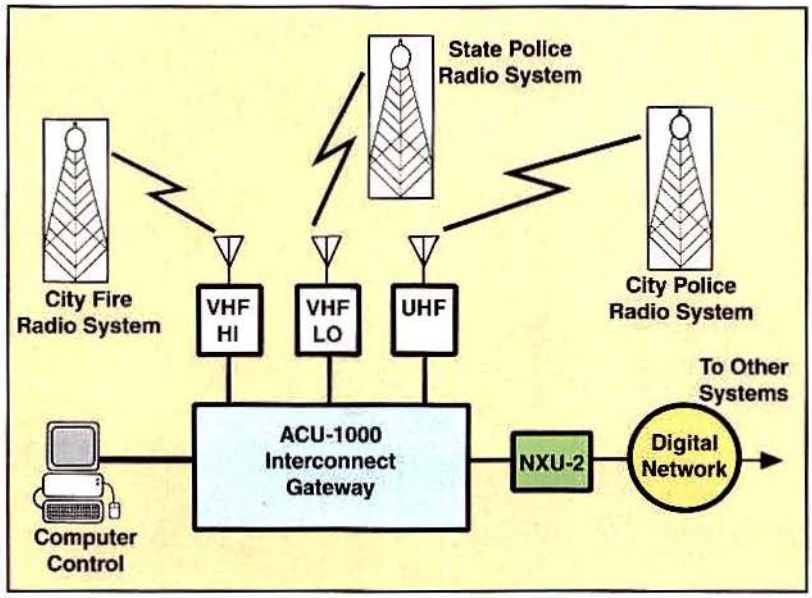
Superior technology.
Impeccable service.

DECIBEL PRODUCTS®
An Allen Telecom Company

ISO9001

www.decibelproducts.com

CIRCLE (33) ON FAST FACT CARD



ACU controller software runs on a PC and allows an operator to control the interoperability network from a central location. It shows 10 communications channels connected in four nets. Net 1 contains Fire #1 and Fire #2 channels. Net 2 contains two police channels. Net 3 contains channels from the Army COE, FEMA and Red Cross. Net 4 contains FBI, ATF and USSS channels.

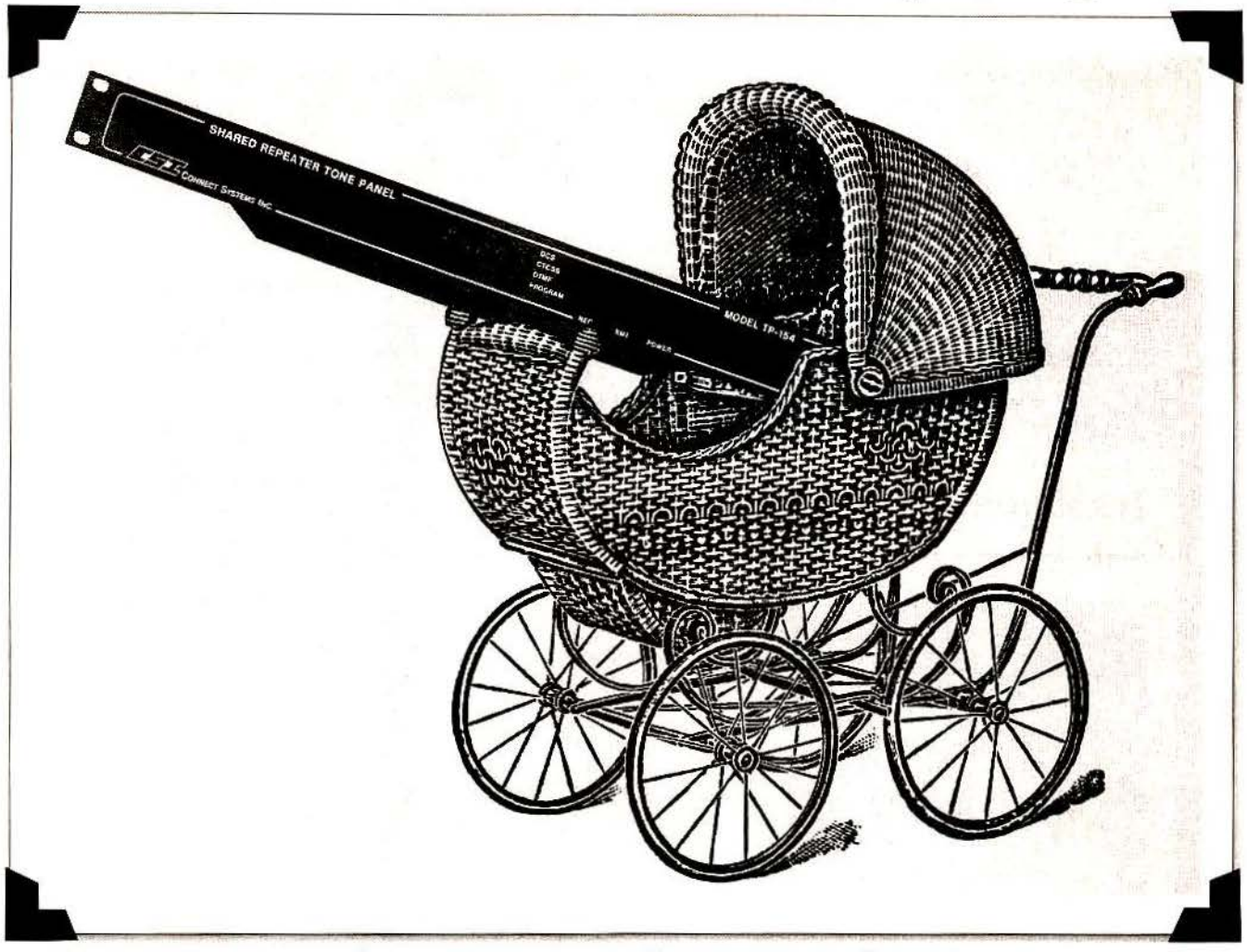
quick to deploy at a disaster, the operator's inability to deal with simultaneous conversations is a major system limitation.

Cellular and landline phones — Telephone service can be a convenient means of providing day-to-day interoperability. However, during disasters, cellular service may be unavailable because of circuit overload; landline circuits can be similarly affected. Landline phones can't reach officers in the field, and telephones don't provide a dispatch-type operating environment.

Trunked radio systems — Trunked radio systems provide excellent daily and disaster communications interoperability among talk groups in the system. Agencies "foreign" to the trunked radio system can interoperate through the trunked system with the aid of a cross-connect gateway.

CIRCLE (34) ON FAST FACT CARD

New Kids on the Block?



Nope! Not Us!

Connect Systems Inc. has consistently brought highly refined communications products to world markets for nearly twenty years. We're famous for tone panels, interconnects, LTR controllers and communications decoders that beats the competition, hands down. We've always delivered products of the highest quality and then some!

Take our TP-154 tone panel as an example. You won't find a better performer that will require zero maintenance year after year. There are thousands in use world wide, performing profitably for every system operator.

Connect with us for a long and happy business relationship.

We're not little kids anymore!!

Connect Systems Inc.
1802 Eastman Avenue, Suite 116
Ventura, California 93003

Toll Free	**(800) 545-1349**
Phone	(805) 642-7184
FAX	(805) 642-7271
Email	sales@connectsystems.com
Internet	www.connectsystems.com

CIRCLE (35) ON FAST FACT CARD

Cross-connect gateway — A cross-connect gateway operates by transparently interconnecting radio audio paths so that agencies can patch into each other's radio channels in real time. This modular, off-the-shelf unit is designed to implement flexible interoperability systems and includes the capability not only to interconnect radio transceivers, but also landline and cellphones. A transportable version housed in a rugged case is available for use at disaster sites. The entire system can be easily controlled from a central point using a computer running controller software. Using this software, rapid set-up and tear down of cross communications paths can be made as needs arise, with quick set up of individual talk nets involving multiple agencies.

Smarter Engineering

It's simple with smart tools

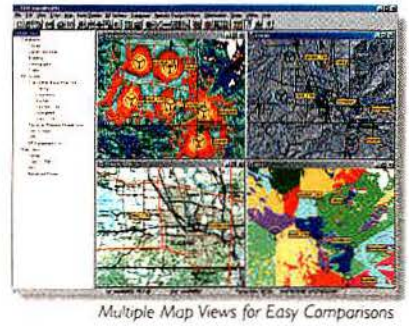
Outdoor Microcell Coverage

Smart Tools

From DC to Daylight, the EDX SignalPro® premier planning tools give you the accurate, comprehensive results you need to design, deploy, and optimize your wireless network. With these tools, you can have a complete solution for outdoor and indoor analysis.

Smarter Engineering

Engineering today's networks is more complex than ever. You need sophisticated planning tools, powerful equipment and expert services. Get the integrated solutions you need from the industry leader – Comarco.



Multiple Map Views for Easy Comparisons

cwt Comarco Wireless Technologies

- Planning Tools
- Test Drive Equipment
- Design & Optimization Services

EDX Tools for Wireless Design

EDX Division, Comarco Wireless Technologies, Inc.
PO Box 1547 Eugene, OR 97440-1547 USA
www.edx.com info@edx.com 541-345-0019 www.comarco.com

CIRCLE (36) ON FAST FACT CARD

Cost-effective interoperability

Trunked radio and cross-connect gateways are two methods that have the flexibility to provide seamless interconnectivity with few disadvantages. Of these two, the cross-connect gateway is the quickest and cheapest to deploy. This is because it works with existing radio infrastructure, allowing agencies to use radios, repeaters and frequency allocations that are already in place. A cross-connect gateway can interconnect 24 radio channels and can be installed and up-and-running in hours at a cost less than $25,000 for a single site.

Using the gateway and a network extension unit (a VoIP device), a multisite statewide interoperability network can be deployed site-by-site as funding becomes available. This type of system is currently being deployed in Maryland.

Implementation of a trunked radio system in most cases requires the complete replacement of an agency's radio infrastructure with deployment times measured in months to years and costs in the millions of dollars. Also, the trunked system still may not include all the agencies that must respond to an emergency, particularly those brought in to deal with specific situations, such as a hazardous spill or a terrorist situation.

A cross-connect gateway is a low-cost option to provide inter-operability even when plans include the eventual installation of a trunked radio system. The gateway also works well within existing trunking systems, where it can provide compatibility with legacy radio systems and help fill in coverage holes. ■

It Stands Alone!

®RAPID ANALYZER I

Battery Analyzer / Conditioner

(NEW)

3 Minute Analyzer
Battery Packs & Cells
(Ni-Cd, Ni-MH, Li-ion)

Impedance Test
25 Seconds
(Ni-Cd, Ni-MH, Li-ion)

One Cup Will Work With
(Ni-Cd, Ni-MH, Li-ion)
Various Capacities

Computer Interface
Ready

Most Cost Effective Unit
In the Market

Many Additional Features
Call 800-221-0732
or Visit Our Website
www.ww-manufacturing.com

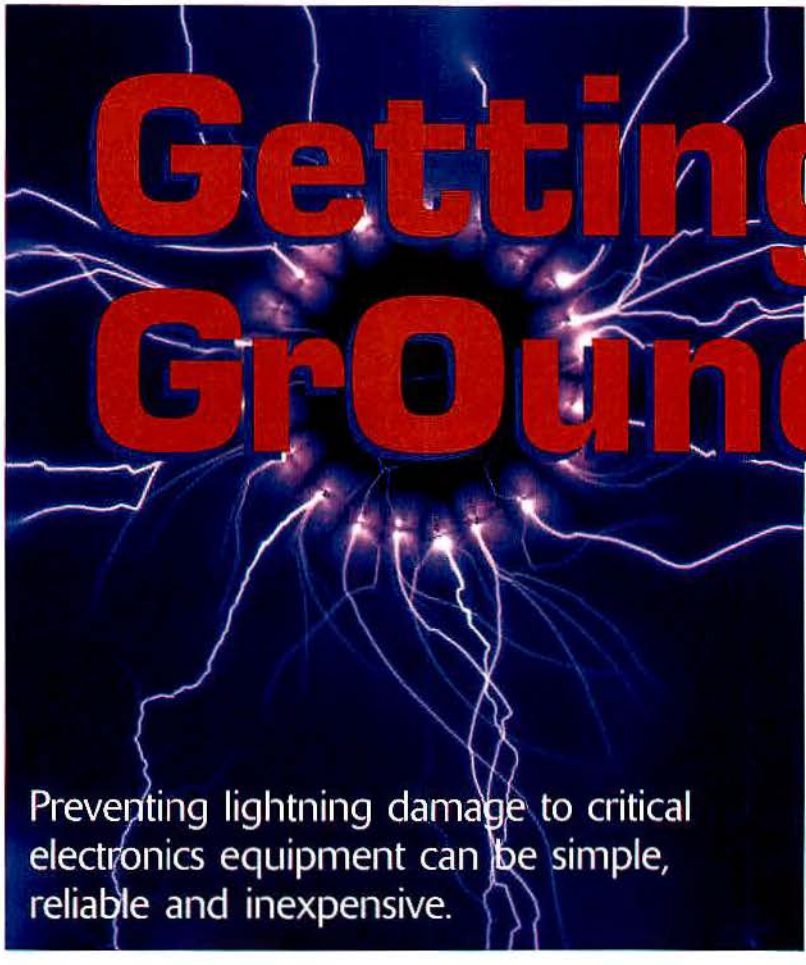
W&W MANUFACTURING CO.

800 South Broadway, Hicksville, NY 11801 • In USA & Canada: 800-221-0732
In NY State: 516-942-0011 • Fax 516-942-1944 • E-Mail: email@ww-manufacturing.com

www.ww-manufacturing.com

CIRCLE (37) ON FAST FACT CARD

Getting GrOunded



Preventing lightning damage to critical electronics equipment can be simple, reliable and inexpensive.

By Ernest M. Duckworth Jr., P.E.

With more than 150 lightning strikes per second, damage to equipment brings losses exceeding $26 billion annually in North America and nearly three times that amount worldwide. Insurance payments for lightning damage claims total 6.5% of all property and casualty claims. Ironically, damage to equipment can be prevented.

Methods that prevent lightning damage are simple, reliable and inexpensive when compared to the cost of repair—not to mention possible injury or death. Remarkably, methods for lightning protection cannot be found in building codes such as the National Electrical Code or the National Electrical Safety Code. Yet, builders rely on these codes for practically all construction in the United States.

Electrical equipment damage from lightning usually can be blamed on one or two reasons: 1) improper or insufficient grounding and 2) no special protection from a ground potential rise (GPR). Improper or insufficient grounding allows equipment to be stressed or damaged by a difference in electrical potential from nearby equipment and metal objects as current flow is misdirected. A lack of special protection from a GPR allows equipment to be stressed because of its attachment to a remote ground through communications wire lines or power-supply wiring.

Standard protection for the termination of communications wireline services is the gas tube. Gas tubes are shunting devices that can be found on virtually every telephone pair terminated in homes and buildings. They are designed to shunt (connect to ground) "incoming energy," and thereby protect equipment and people from harm.

However, no shunting device protects electronic equipment from a GPR, or "outgoing energy." High outgoing current flow from a lightning strike effectively lifts electrical ground. During a GPR, the shunting devices are connected to an elevated ground and merely offer an additional current path from the site to a remote ground. In this unfortunate way, gas tubes guarantee a connection of the communications path in the reverse direction from which they were intended to operate when there is a GPR. (See Figure 1.)

Dangers from outgoing energy

The outgoing energy from a GPR places most telephone and power installations at risk for equipment damage and the people near them at risk for harm. One of the most dangerous locations for people is a 9-1-1 public safety answering point. The typical PSAP is a small building beneath a large radio tower. The tall tower supports radio communications antennas and forms a lightning target. Workers taking emergency calls must be at the PSAP phones constantly. They do not have the luxury of staying off the phone during lightning

Duckworth is strategic accounts manager at SNC Manufacturing, Oshkosh, WI.

Introducing the MT-900 Mobile Radio.

The newest addition to our product line, the MT-900, is a full-featured 32 channel, 40-watt UHF transceiver.

Features include:

- CTCSS/DCS
- 2-Tone decode
- ANI
- 5 programmable scan modes

The MT-900 is channel and mode controlled with Up/Down selectors and an 8-character alpha-numeric LCD display. Microphone and programming cable use a modular jack designed to be compatible with numerous industry accessories. An external speaker jack is coupled with a 10-watt public address system and on/off button on the control panel.

One-piece die-cast aluminum construction makes this tough, rugged unit able to withstand the most demanding user. Outfitted with a heavy duty mic, fused power cord and mounting bracket kit.

Tekk, Inc. is the authorized licensed manufacturer of Remington Radios, including the FRS and GMRS radios. Check out our line of hand-held products which now feature voice scrambling and increased audio output. Call us at 1-800-521-8355 or visit our website at www.tekkinc.com.

TEKK

Professional 2-Way Communications

1-800-521-8355

www.tekkinc.com

Remington is a trademark used under license from RA Brands LLC by Tekk, Inc.

CIRCLE (38) ON FAST FACT CARD

storms, which is recommended in virtually every telephone book.

The only effective method of protecting equipment connected to wireline communications from a GPR is through isolation—using optical isolators or isolation transformers. These devices prevent current flow. With no metallic path, there will not be outgoing current flow, equipment damage or risk of injury to workers. (See Figure 2.)

To control lightning-strike energy as it dissipates requires division. There is no substitute for division for successfully dissipating the energy because of the magnitude of the current and the resulting surge impedance of any single dissipation path. Using 10 radials connected to a ground ring that is bonded to an antenna divides lightning current into 10 smaller segments. This division helps to ensure that the lightning will follow the grounding conductors for dissipation into the earth. The improved dissipation also serves to reduce the resulting GPR to the adjacent equipment-building grounding system.

The copper wire grounding system can be greatly improved by placing conducting cement around the radials at the time of installation. The cement hardens into concrete, protecting the grounding system and giving it many more years of life. It also gives the system a lower ground resistance.

Tower location

Equipment buildings must be at least 30 feet from antenna towers. This is done to avoid damage caused to electronic circuits by the magnetic field associated with lightning. Magnetic field strength drops off as the square of the distance. If the real estate configuration prevents separating the building at least 30 feet from its antenna tower, consideration must be given to engineering a Faraday cage (wire mesh) around the interior of the building. Without a Faraday cage, equipment damage cannot be prevented no matter how well the equipment is grounded or isolated from remote ground.

Another reason to place equipment buildings or shelters at least 30 feet from antenna towers is to keep the lightning GPR at the tower base from saturating the building grounding system before most of the energy is dissipated in the earth. The grounding systems for the building and its tower must be bonded together at one single point, but a bond of 30 feet or more will significantly reduce the resulting

CIRCLE (39) ON FAST FACT CARD

The Affordable INTEROPERABILITY Solution.

JPS Communications is the premiere provider of mission critical Interoperability solutions. Direct communications between local, state and federal agencies at the scene of a disaster, regardless of radio frequency, type, make, or model, including TETRA, has never been Easier!

ACU-1000
Intelligent Interconnect

Visit Us at IWCE Booth# 10092

Call Today for more product information!

5800 Departure Drive
Raleigh, NC 27616
Ph: (919) 790-1011
Fax: (919) 790-1456
Email: jps@jps.com
Web: www.jps.com

CIRCLE (40) ON FAST FACT CARD

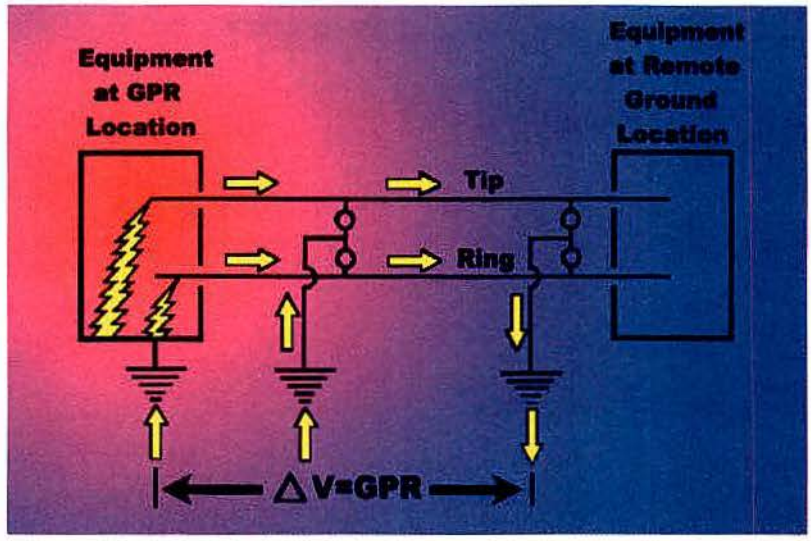


Figure 1. Communications without isolation protection.

GPR at the shelter because of the impedance of the lengthy bond. This is a rare exception in which a lengthy bond is an advantage in supporting a robust grounding system.

Single-point grounding (a "ground window") is absolutely necessary to prevent equipment damage because the GPR from lightning strikes is a wave of rising voltage or an energy surge that passes through a grounding system. The nature of the wave demands that all equipment should be bonded to the grounding system at one location to ensure that the electrical potential of every metallic object connected to it rises and falls together. (See Figure 3.)

Anyone using equipment susceptible to GPR must be protected by a single-point grounding system to guarantee that they won't be injured by touching different pieces of equipment that otherwise might have different and harmful electrical potentials when lightning strikes. This phenomenon is also known as "touch potential."

The use of a ground window (also called a bulkhead panel or

Five Essential Power Functions In a 2RU Package

Mount the **Integrated Power System**, make three plug-in connections, and in mere minutes you've installed a 600 watt rectifier, reserve battery string, system meters, status indicators and alarm contacts – all occupying only 2RU of rack space! Plug in a second unit and you've created a 100% redundant power system with no single point of failure.

This plug-and-play solution saves hours of engineering and installation compared to the individual component approach, and provides a full-function, ultra-high reliability power system.

- **Precision Rectifier** 12V-40 Amp, 24V-22 Amp or 48V-11 Amp
- Built-in **Battery Bank**
- L.E.D. **Status Monitors** and Digital Volt/Amp **Metering**
- **Alarm Contacts**
- **Low Voltage Battery Disconnect**
- Plug-in port quickly configures **Parallel/Redundant System**
- Plug-in port for **Supplemental Battery String**

NEWMAR®
Telecom Power Products

Plug-In Rackmount Battery Modules Now Available

Newport Beach, CA
Phone: (800) 854-3906 • FAX: (714) 957-1621
www.newmartelecom.com

CIRCLE (41) ON FAST FACT CARD

JOTTO DESK®

Computer Mounts & Equipment Consoles
* Optimize Vehicle Space
* No Holes Mounting
* Easy-to-Use
* Easy-to-Install

www.jottodesk.com

Call Toll Free 877-455-6886

Jotto Desk® is a patented product of Assembled Products® Corporation. Contour Console is a patented product.

CIRCLE (42) ON FAST FACT CARD

ASTRON CORPORATION 9 Autry Irvine, CA 92618
(949) 458-7277 • (949) 458-0826

www.astroncorp.com

...POWER ON WITH ASTRON

SWITCHING POWER SUPPLIES...

MODEL SS-10TK

MODEL SS-12IF

SPECIAL FEATURES:

- HIGH EFFICIENCY SWITCHING TECHNOLOGY SPECIFICALLY FILTERED FOR USE WITH COMMUNICATIONS EQUIPMENT, FOR ALL FREQUENCIES INCLUDING HF
- HEAVY DUTY DESIGN
- LOW PROFILE, LIGHT WEIGHT PACKAGE
- EMI FILTER
- MEETS FCC CLASS B

PROTECTION FEATURES:

- CURRENT LIMITING
- OVERVOLTAGE PROTECTION
- FUSE PROTECTION.
- OVER TEMPERATURE SHUTDOWN

SPECIFICATIONS:

INPUT VOLTAGE: 115 VAC 50/60HZ
OR 220 VAC 50/60HZ
SWITCH SELECTABLE

OUTPUT VOLTAGE: 13.8VDC

AVAILABLE WITH THE FOLLOWING APPROVALS: UL, CUL, CE, TUV.

MODEL SS-18

DESKTOP SWITCHING POWER SUPPLIES

MODEL	CONT. (Amps)	ICS	SIZE (Inches)	Wt.(lbs.)
SS-10	7	10	1⅛ x 6 x 9	3.2
SS-12	10	12	1⅝ x 6 x 9	3.4
SS-18	15	18	1⅝ x 6 x 9	3.6
SS-25	20	25	2⅞ x 7 x 9⅝	4.2
SS-30	25	30	3¾ x 7 x 9⅝	5.0

MODEL SS-25M

DESKTOP SWITCHING POWER SUPPLIES WITH VOLT AND AMP METERS

MODEL	CONT. (Amps)	ICS	SIZE (Inches)	Wt.(lbs.)
SS-25M*	20	25	2⅞ x 7 x 9⅝	4.2
SS-30M*	25	30	3¾ x 7 x 9⅝	5.0

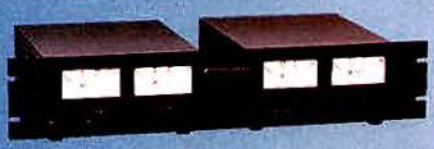
MODEL SRM-30

RACKMOUNT SWITCHING POWER SUPPLIES

MODEL	CONT. (Amps)	ICS	SIZE (Inches)	Wt.(lbs.)
SRM-10	7	10	3½ x 19 x 9⅝	4.3
SRM-12	10	12	3½ x 19 x 9⅝	4.7
SRM-18	15	18	3½ x 19 x 9⅝	5.0
SRM-25	20	25	3½ x 19 x 9⅝	6.5
SRM-30	25	30	3½ x 19 x 9⅝	7.0

WITH SEPARATE VOLT & AMP METERS

MODEL	CONT. (Amps)	ICS	SIZE (Inches)	Wt.(lbs.)
SRM-25M	20	25	3½ x 19 x 9⅝	6.5
SRM-30M	25	30	3½ x 19 x 9⅝	7.0



MODEL SRM-30M-2

2 ea SWITCHING POWER SUPPLIES ON ONE RACK PANEL

MODEL	CONT. (Amps)	ICS	SIZE (Inches)	Wt.(lbs.)
SRM-25-2	20	25	3½ x 19 x 9⅝	10.5
SRM-30-2	25	30	3½ x 19 x 9⅝	11.0

WITH SEPARATE VOLT & AMP METERS

MODEL	CONT. (Amps)	ICS	SIZE (Inches)	Wt.(lbs.)
SRM-25M-2	20	25	3½ x 19 x 9⅝	10.5
SRM-30M-2	25	30	3½ x 19 x 9⅝	11.0

MODEL SS-12SM/GTX

MODEL SS-10EFJ-98

CUSTOM POWER SUPPLIES FOR RADIOS BELOW

EF JOHNSON AVENGER GX-MC41
EF JOHNSON AVENGER GX-MC42
EF JOHNSON GT-ML81
EF JOHNSON GT-ML83
EF JOHNSON 9800 SERIES
GE MARC SERIES
GE MONOGRAM SERIES & MAXON SM-4000 SERIES
ICOM IC-F11020 & IC-F2020
KENWOOD TK760, 762, 840, 860, 940, 941
KENWOOD TK760H, 762H
MOTOROLA LOW POWER SM50, SM120, & GTX
MOTOROLA HIGH POWER SM50, SM120, & GTX
MOTOROLA RADIUS & GM 300
MOTOROLA RADIUS & GM 300
MOTOROLA RADIUS & GM 300
UNIDEN SMH1525, SMU4525
VERTEX — FTL-1011, FT-1011, FT-2011, FT-7011

NEW SWITCHING MODELS

SS-10GX, SS-12GX
SS-18GX
SS-12EFJ
SS-18EFJ
SS-10-EFJ-98, SS-12-EFJ-98, SS-18-EFJ-98
SS-12MC
SS-10MG, SS-12MG
SS-101F, SS-121F
SS-10TK
SS-12TK OR SS-18TK
SS-10SM/GTX
SS-10SM/GTX, SS-12SM/GTX, SS-18SM/GTX
SS-10RA
SS-12RA
SS-18RA
SS-10SMU, SS-12SMU, SS-18SMU
SS-10V, SS-12V, SS-18V

CIRCLE (43) ON FAST FACT CARD

*ICS – Intermittent Communication Service

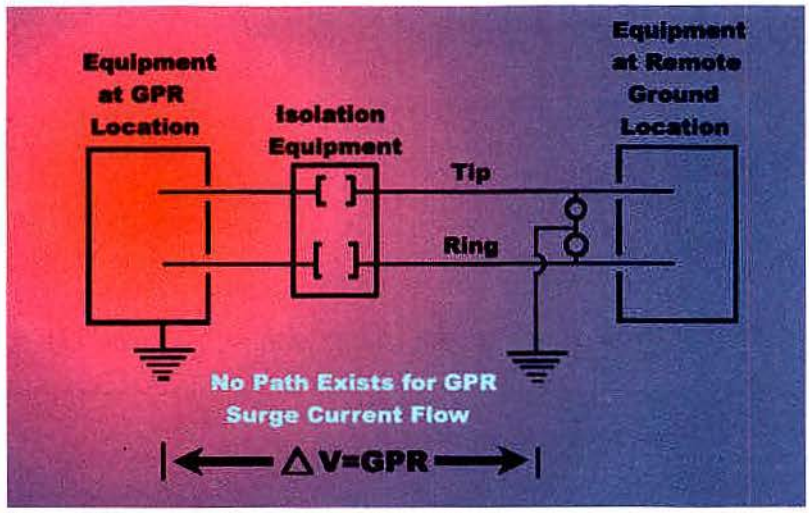


Figure 2. Communications with isolation protection.

waveguide hatch) where coax cables, waveguide and antenna wires penetrate the wall of the equipment building is indispensable. The bulkhead is made of solid copper. Its proper engineering design and installation will ensure that lightning energy does not enter the equipment building on cables from the antenna tower.

The bulkhead must be bonded to the building grounding system at the single-point grounding location—the same single point ground where the tower grounding system is bonded to the building grounding system.

Isolate wireline comms

A lightning strike to a grounding system produces an elevated ground or GPR. Any equipment bonded to the grounding system and also connected to wireline communications is likely to be damaged by outgoing current seeking remote ground. Individuals who may be working on equipment connected to the wire lines could be harmed because they would be in the path of the outgoing current.

An engineering design that protects this equipment isolates the wireline communications from the

Merry Electronics (USA)

Merry Electonics (USA) manufacturers a complete line of microphones for Marine, Land Mobile and Handheld radios. We are a full service OEM manufacturer for the communications industry

Merry Electonics (USA) Co., LTD.
15360 E Valley Blvd
Industry, Ca 91746
Phone: 626-333-8985
Toll free: 800-227-5206
Fax: 626-333-0215
E-mail: merryusa@aol.com
Web Site: www.merry.com.tw

CIRCLE (44) ON FAST FACT CARD VISIT US AT IWCE, BOOTH 16071

RUGGED 75 AMP POWER SUPPLY

Anchors NEW DuraComm "DPS" Series Line

Now in 15, 30, 45, 55 and 75 amps @ 12VDC (adjustable output)

- 15.5 and 25 amp versions @ 24VDC (adjustable output)
- Protected against brownout and AC spike input to 190 volts
- Reverse battery polarity, over-current & over temp protected
- UL/CUL Listed

Microprocessor controlled automatic 3 stage smart charger option can be used with all DPS converters ... increases charge capacity, decreases charge time, prevents over-charging.

Contact your communications distributor or call or fax us Toll Free

Phone 1•800•467•6741 Fax 1•800•825•1403

DuraComm® CORPORATION

203 W. 23rd Ave.
North Kansas City, MO.
64116

On the Web at www.duracomm.com
Email: duracomm@duracomm.com

CIRCLE (45) ON FAST FACT CARD

NENA's 2002 ANNUAL CONFERENCE

THE NEW 9-1-1

9-1-1 POLICE • MEDICAL • FIRE EMERGENCY NENA

The September 11 tragedy placed public safety in the National spotlight, giving NENA and 9-1-1 a new sense of urgency. Events at this year's Annual Conference will include representation from the US Department of Transportation (DOT), Homeland Security, the FCC, and ComCARE Alliance. The conference in Indianapolis will allow you to network with other industry professionals, discuss the critical issues of the day, and experience never-before offered programs such as the Wireless 9-1-1 Info Room, the CEO Panel, FCC Regulatory Updates, courses from the FBI and more than 85 educational track sessions. You can't miss the NENA Annual Conference this year. It will help you, your agency or company and your industry prepare for the Future of 9-1-1.

Serving the Public in Changing Times

NENA '02 #nDy THE NEW 9-1-1 Serving the Public in Changing Times

CIRCLE (46) ON FAST FACT CARD

Contact NENA at 1-800-332-3911 or visit www.nena.org

Indiana Convention Center and RCA Dome
Indianapolis, Indiana
June 16-20, 2002

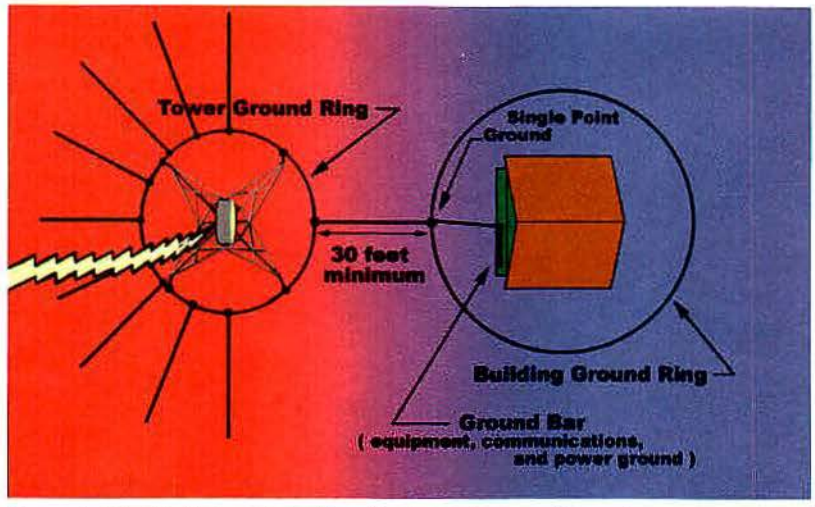


Figure 3. Ideal lightning dissipating single-point grounding system.

remote ground. Isolation is accomplished using optical isolators, isolation transformers or both. The isolation equipment, called the high-voltage interface, is housed together and mounted on a nonconducting surface in a nonconducting cabinet.

The HVI isolates the communications equipment during a GPR and prevents a current from flowing from the grounding system with higher electrical potential to a grounding system with a lower potential. The isolation completely protects equipment from damage and people from harm.

Simple lightning protection

Simple, reliable and inexpensive protection methods can prevent lightning damage to equipment. The three most important concepts are:

1) divide and control the lightning strike energy.
2) design a true single-point ground system.
3) isolate wire-line facilities from a remote ground.

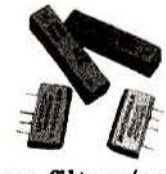
A reliable, well engineered grounding design will all but completely eliminate lightning threats to equipment and people. ■

Pagers, parts, and more

P&W Paging & Wireless Service Center

Motorola Keynote pagers:

- ☒ $99 Monitor Only
- ☒ $120 2-tone page only
- ☒ $170 2-tone page & Monitor
- ☒ On freq with 90 day warranty



Monitor board

- ☒ Installed in a Keynote $50
- ☒ Installed in a Director II $60
- ☒ Board only $40 each (Min 10 boards)

Tone filters/reeds

- ☒ Minitor I $20 each
- ☒ Minitor II $25 each
- ☒ In stock reeds/filters only

Minitor II scan board

- ☒ Installed $50 each
- ☒ Do it yourself kit $40 each

Programmer interface $115

- ☒ Replaces Motorola #NLN3548B

Minitor III pagers $299

- ☒ Add $40 for Stored Voice
- ☒ Add $60 for 2 channel
- ☒ Add $38 for 5 year warranty
- ☒ Add $99 for amp charger (in place of std)
- ☒ These are brand new units
- ☒ One year factory warranty

800-822-2180

Fax: 561-683-0059

1300 N FL Mango Rd #21

West Palm Beach, FL 33409

http://www.pwservice.com

Authorized Dealer pricing shown others slightly higher

VISA MasterCard DISCOVER NOVUS

Motorola, Minitor, Director & Keynote are reg. trademark of Motorola Inc.

CIRCLE (47) ON FAST FACT CARD

4RV/2 VOTER

- Continuous or "vote-lock" mode
- Available as a card or in a rack system
- Price Performance leader for 10 years
- Extend coverage by adding receivers
- Thousands of DHE Voters in service
- 4 Channels expandable to 64
- Many custom applications
- Select / disable switches
- RF Links or phone lines
- Opto-isolated I/O
- Signal-To-Noise
- Modular design

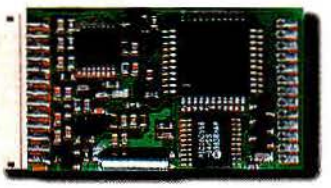
STARTING AT JUST $410

For more details call, fax, or write to:

Doug Hall Electronics

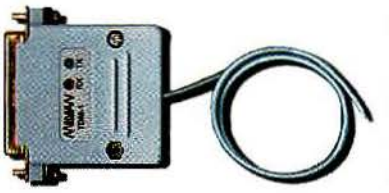
815 E. Hudson St
Columbus, Ohio 43211
(614) 261-8871
FAX (614) 261-8805
http://www.dheco.com

CIRCLE (71) ON FAST FACT CARD



Rolling Code Scramblers

- **High security** - 1 trillion possible codes
- Superior audio quality
- Fleet management w/ CAD or DDU-300: ANI, Selcall, OTAR, & Deadbeat Disable



1200 Baud Data Modem

- Designed specifically for radio use
- Transparent or addressable modes
- Features data buffering & flow control

Speech Inversion Scramblers

- **VPU-11:** Factory programmable to any inversion code between 2000-4096 Hz
- **VPU-12:** 16-code version: 2200-4096 Hz
- **VPU-15:** 4-codes, ANI & encode/decode

Repeater Maker

- Remote access/disconnect using DTMF
- Programmable hang time/time-out timer
- 2 selectable Morse IDs, CTCSS filter

We've Got It All!

See us at IWCE, Booth #14066

OEM Plug-In Products

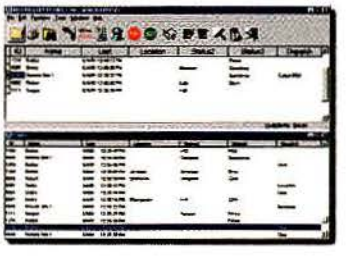
- For Motorola, Icom, Maxon, Tait & Vertex
- We offer: Rolling code & inversion voice scramblers, ANI, & decoders

CTCSS/DCS Encoders/Decoders

- 38 CTCSS codes plus splits
- 106 DCS codes
- 64 memories (6-line binary)
- Available with ANI, TOT, & Penalty

Universal Encoders/Decoders

- 2-tone, 5-tone, DTMF, &/or Pulse tone
- Features include ANI, selective calling, transpond, Deadbeat Disable, and more
- Microphone/dashmount versions available



Computer-Aided Dispatch

- MDC-1200®, DTMF, 5-tone, & GE-Star®
- Most models offer: aliasing, logging, spy, radio check, & Deadbeat Disable

Automatic Number Identifiers

- Available in MDC-1200®, GE-Star®, DTMF, 5-tone, & 2-tone
- Features time-out timer, emergency ANI, & leading &/or trailing ANI

Desktop Display Unit

- **DDU Series:** ANI Display Decoder with aliasing & last 10 ANI recall
- MDC-1200®, DTMF, 5-tone & GE-Star®

27 Years of Innovative, Quality Signaling & Scrambling Products

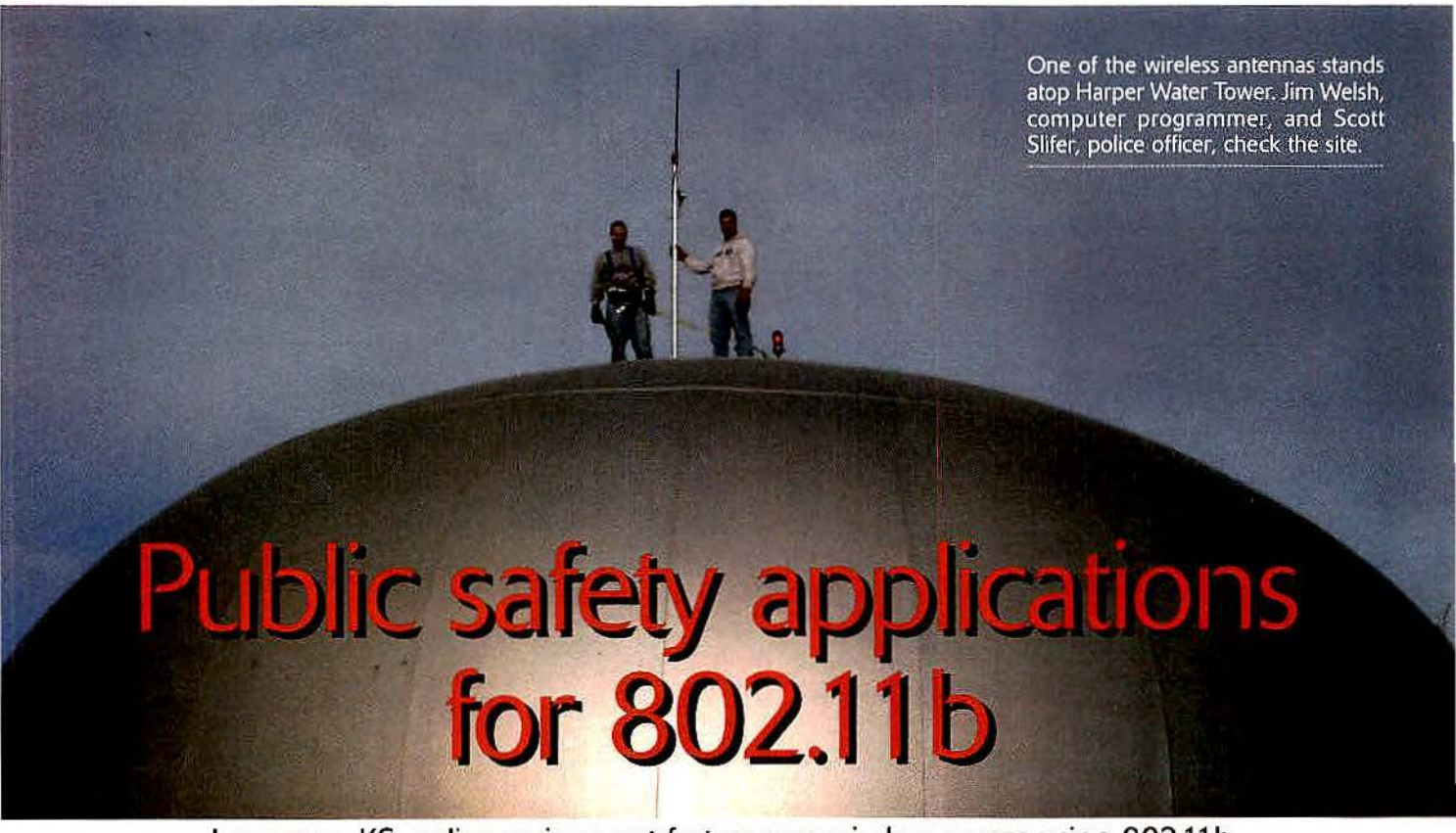
MIDIAN ELECTRONICS

ORDERS: 1-800-MIDIANS (643-4267)

2302 E 22nd St • Tucson, AZ 85713 • Ph: 520-884-7981 • Fax: 520-884-0422

E-mail: sales@midians.com • Web: www.midians.com

MDC-1200 is a registered trademark of Motorola C & E, GE-Star is a registered trademark of GE/Ericsson



One of the wireless antennas stands atop Harper Water Tower. Jim Welsh, computer programmer, and Scott Slifer, police officer, check the site.

Public safety applications for 802.11b

Lawrence, KS, police cruisers get fast, secure wireless access using 802.11b.

By James Careless

802.11b: Don't let the jargony name scare you. In plain English, 802.11b merely describes the standard for transmitting data at speeds as high as 11Mbps, on the unlicensed 2.4GHz band.

802.11b wireless technology is special for two reasons. First, it makes it possible to extend a high-speed network quickly because wires do not have to be installed. Second, 802.11b is relatively cheap compared to the expense of adding T1 or even lower-speed ISDN lines.

"For minimizing infrastructure between buildings, 802.11b is so much more cost-efficient compared to T1 or ISDN," said William A. "Sam" Smith, a systems analyst with the city of Lawrence, KS. "With 802.11b, you can establish a link between buildings with 4MB throughput for about $3,000 and you own the infrastructure."

But that's not all 802.11b can do, as the Lawrence, KS, Police Department has discovered. By creating 802.11b links between its wired wide-area network and 14 LKPD cruisers (plus four more owned and operated by the University of Kansas), the LKPD has given its patrol cars the same connectivity found in the station house.

Strategic considerations

The only downside? Due to budget constraints, not all of the LKPD's cruisers are equipped with 802.11b transceivers and hardened Panasonic laptops. As a result, "at a shift change, our officers run out to get a car that has a laptop," said Lt. David L. Cobb, who heads the LKPD's Information Technology department. "It's a shift supervisor's dream."

For the LKPD, maximizing resource use is a must. "We are a lean department," said Cobb. "We are under the 1.5 officers-per-thousand-population national average. In fact, Lawrence only has 0.75 officers per thousand.

"As a result, we find ourselves going from call to call," he added. "To cope, we're trying to stretch what our officers can do. That's why we try to keep them out in the field, so that our response times are faster."

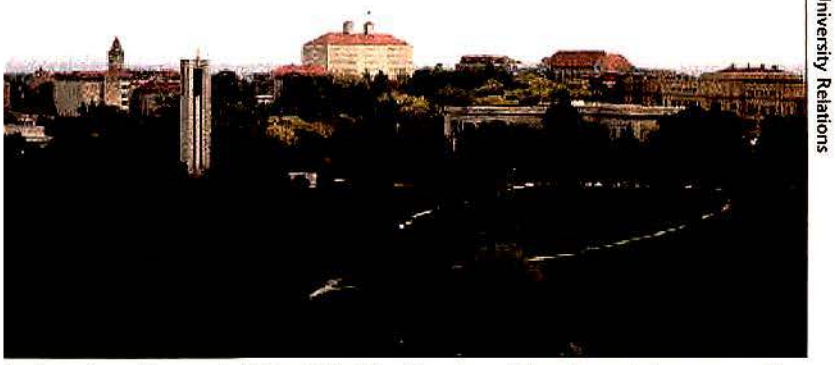
This is where 802.11b makes such a difference. Rather than losing precious time writing reports at the station, LKPD officers can compile them in their cars. After all, "when they do come to the station, it takes time to park the car, walk up the steps to the second floor, sit down and maybe get interrupted," Cobb said. "As a result, each officer uses up a minimum of 20 minutes per station visit, without actually getting any work done."

Ironically, the LKPD didn't

Careless is a freelance telecommunications writer based in Ottawa, ON, Canada. His email address is *james@tjtdesign.com*.

initially adopt 802.11b to solve this problem. Instead, it chose wireless networking when the department was split into two separate locations.

"We were all in one center until a year ago," Cobb said. "Then the city purchased a building in the west end. Today, the chief of police, the training department and the detectives have moved to that building. Meanwhile, the patrol division, technology and evidence are in the old building at 111 E. 11th."



KU University Relations

A view from the roof of the 11th Street police station toward the new police building several miles beyond. The horizon shows that line-of-sight radio propagation between the police facilities is blocked by Mount Oread, home of the University of Kansas campus.

Tactical realities

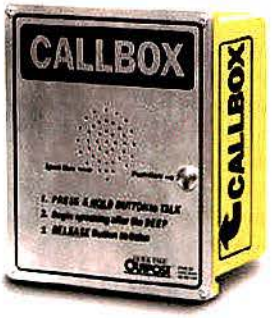
For the LKPD, it was vital to have connectivity between our two sites. "When they moved out last year, we had the daunting task not only of duplicating phone lines, but paying for it," Cobb said. Well, the city is on a tight budget; we couldn't afford to physically duplicate our wired networks. That's why we went to 802.11b instead."

To provide the LKPD with 802.11b connectivity, the department has installed eight towers

Radio Callbox

Cost-Effective Wireless Communication for Any Location

- VHF/UHF/UHF LTR/PassPort Trunking Models
- Auto Shut-off or "Standby-Listen" Feature*
- Alkaline or External Power Option
- Reinforced Fiberglass Enclosure
- Stainless Steel Faceplate with Tamper Resistant Fasteners
- Sealed, Stainless Steel, Tamper Resistant Push-To-Talk Button
- Sealed RF Electronics Package
- Built-In DTMF ANI* Allows CallBox Monitoring
- Easy to install, inexpensive add-on to any existing radio system



* RQX-454/XT model only

Ideal for: Golf Courses, Airports, Schools, Parking lots, Construction sites, Parks, Playgrounds, Marinas, Pools, Manufacturing, Warehousing, Hotels, Property Management/Apartments, Shopping Malls, Campgrounds, Hospitals, or anywhere wireless two-way radio communication is needed.

Call Today 800-USA-1-USA (800-872.1.872)
for information or a dealer near you
visit us at www.ritron.com

MADE IN THE USA

RITRON®
Wireless Solutions

Dealer Inquiries Welcome

P. O. Box 1998 • Carmel, IN 46082 • ph: 317-846-1201 • fax: 317-846-4978 • email: ritron@ritron.com

CIRCLE (48) ON FAST FACT CARD

Voice Logging Recorders...

automatically document phone conversations, meetings and two-way radio messages – compact, affordable, easy to install, operate, upgrade, maintain and purchase...

★ Digital and Analog
★ 1 to 16 channels
★ $190 to $7840
★ 12 off-the-shelf models plus custom systems to meet unique requirements ★ Multi-channel recorders store 1600 hours on internal hard drive and back up on CDRs ★ Multi-function single channel recorder stores 1350 hours on internal HD ★ Conference recorders and microphones ★ Call center supervisory recorders ★ Software and hardware that turns your PC into an automatic voice logger ★ Over 1000 dealers worldwide ★ Dealer inquiries welcome ★ **Omnicron** – Providing affordable solutions for archival voice storage and supervisory monitoring **since 1975.**

omnicron

OMNICRON ELECTRONICS
581 Liberty Highway
Putnam, CT 06260
860•928•0377
FAX: 860•928•6477

www.omnicronelectronics.com

CIRCLE (49) ON FAST FACT CARD

throughout the region, with nine "bridges" to connect the 2.4GHz portals to the LKPD WAN.

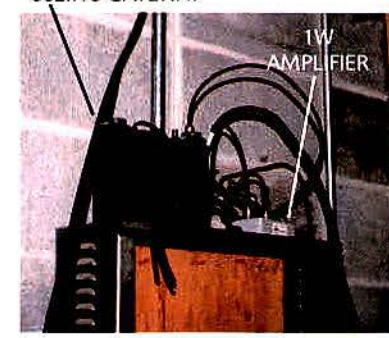
"The network is built on Cisco Aeronet equipment," Smith said. "The bridges are Cisco 340 bridges. For each site, you need a 42-inch omni antenna with 12dB gain, cabling, amplifier, UPS, timer and a box to put it all in—plus a galvanized steel pole, of course, to attach the antenna to."

As for the all-important cost? This is where 802.11b really comes through for the LKPD.

"The outside figure on each tower is $4,000 per tower," Smith said. "For each vehicle, 802.11b technology is $1,500 plus the cost of the laptop. Finally, the firewall technology—which keeps outsiders from using the wireless portals to hack into our WAN—works out to about $3,000 to $4,000 per site."

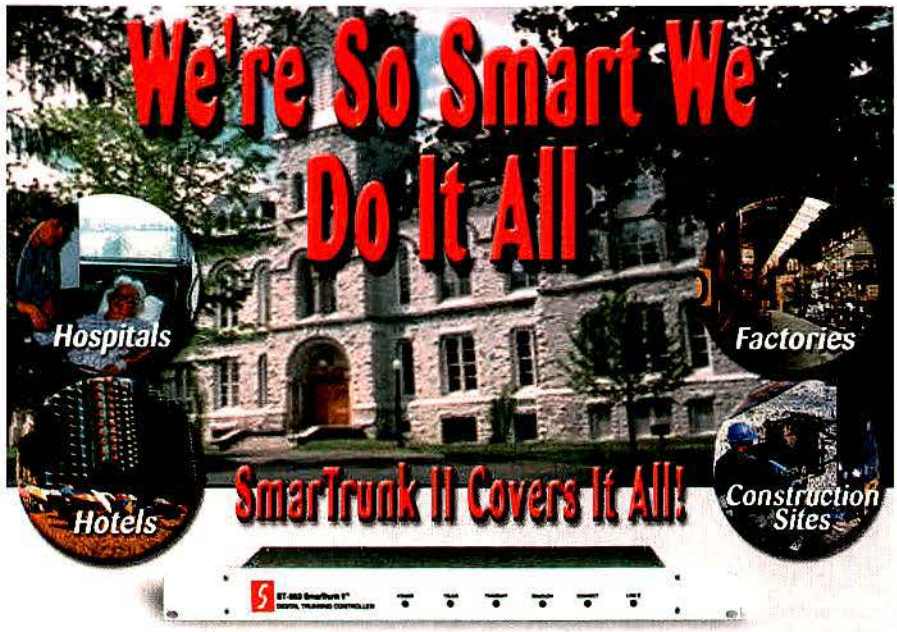
Smith said that every last

802.11b GATEWAY



To boost range a little, the 100mW output of the 802.11b gateway is fed to an RF amplifier.

Omnidirectional 12dB gain antennas for the 802.11 gateways in the 11th Street police station fit on tower side-mounts.



Looking for new sales opportunities in a difficult market? Enhance your customers' communications systems by offering the SmarTrunk II Digital Trunking System. Ideally suited for private "campus" systems, SmarTrunk II offers all the benefits of modern trunking technology at a very reasonable cost:

- Automatic selection of a clear channel
- Channel privacy and exclusivity for each user group
- Selective (private) calling, to both individuals and groups
- Radio stun/kill to disable unauthorized users
- Increased system loading with a higher level of service.

How about interconnecting with the company PABX? No problem with SmarTrunk II, since telephone interconnect is a standard feature. Now mobile employees can easily call office workers or even access the PSTN through the office switchboard.

Since SmarTrunk II is an "overlay" system, it can be easily added to an existing conventional radio system (up to 16 channels). The ST-853 SmarTrunk II controller is compatible with any base station or repeater, while SmarTrunk II mobile logic boards are available for many popular radio models from Icom, Kenwood, Motorola and Vertex/Standard. And with the new ST-510 Wide Area Network Switch, different campus sites can even be linked together into a single, integrated communications network.

Call us or visit our web site today to learn more about how you can increase your sales with SmarTrunk II, the industry's most widely used VHF/UHF radio trunking system.

Like we said, we do it ALL!

www.smartrunk.com

SmarTrunk Systems, Inc.

2600 Kitty Hawk Rd., Ste. 109 / Livermore, CA 94550
Phone: (925) 373-1950 / Toll Free (866) 870-9052
Fax: (925) 371-8832
Email: salesinfo@smartrunk.com / www.smartrunk.com

CIRCLE (50) ON FAST FACT CARD

"For minimizing infrastructure between buildings, 802.11b is so much more cost-efficient compared to T1 or ISDN."
—William A. "Sam" Smith, systems analyst.

"... We're trying to stretch what our officers can do. That's why we try to keep them out in the field, so that our response times are faster."
—Lt. David L. Cobb, head of LKPD's Information Technology department.

piece was off-the-shelf commodity equipment. "Which is both a benefit and a problem. With off-the-shelf equipment, the price is driven down. But because of that, and because there is so much equipment out there, it is susceptible to attack. If you don't have it set up properly, it is possible to break into it."

So the department uses inherent wireless equivalency protocol encryption with the 802.11b units. "We treat that infrastructure as being external to our network," Smith said. "We've put firewalls between it and the department; officers have to log in using passwords, in order to get access, as well."

Pros ...

For LKPD officers equipped with Panasonic laptops and 802.11b access, the daily grind has become significantly easier.

It's not just the convenience of writing reports in their cars, rather than back at the office. What really makes 802.11b powerful for patrol cars is the connectivity it provides.

With this technology, "officers in cars can look up cases and phone numbers or go to the Internet," Smith said. "They have all of their resources in the car as they would have in a 'traveling office.'

"Another benefit comes from being able to call up mug shots," Cobb said. " If a suspect swears it isn't him, the officer can walk him back to see the photo on the laptop and say, 'Actually, this is you.'"

Officers also have instant access to bulletins that they can look up daily. "They can also take photos and load them into the host computer, and download photos to the laptop without coming into the station, using the digital photo linkup," Cobb said.

... And cons

Of course, no system is perfect, and 802.11b is no exception.

Its major limitation is range. Under ideal conditions, the most one can hope for is one-quarter to one-half mile's worth of coverage.

"If you're using the conventional power of the bridges, you're limited to 100mW," Smith said. "You can amplify those to 1W, but that still limits you to quarter to half-mile radial line of sight. That's unlike a data stream on an 800MHz system, which would cover an entire area."

To make things tougher, "802.11b signals at 2.4GHz are absorbed by water," Smith said. "Any water-bearing object in the path cuts the signal, including rain."

802.11b is worth considering

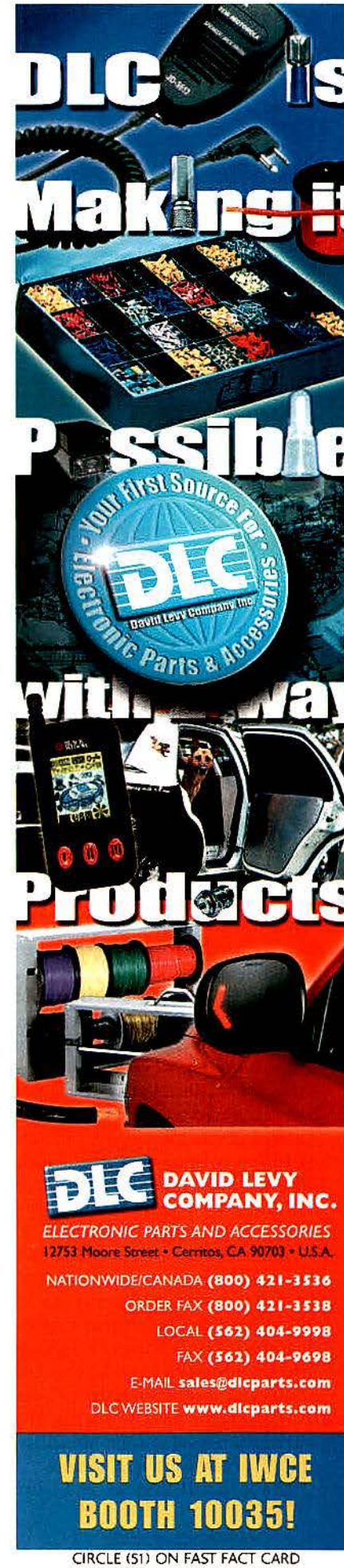
Limitations aside, the LKPD is still pleased with 802.11b and so are its police officers.

"We have no formal research," Cobb said. "But the officers seem happy with what they have."

So is 802.11b worth considering for your department? Yes. It offers a range of advantages at an affordable cost.

One added bonus: "We have some secrets we won't publicize that might help other departments to make the technology work for them," Cobb said. "They can contact us by emailing *smith@lkpd.org*."

For public safety network users—and the people who sell them equipment—802.11b's time has definitely come. ■



CIRCLE (51) ON FAST FACT CARD

The changing demands of modern battery testers

With memory no longer posing a problem to battery testers, they have assumed new tasks such as performance verification and the energizing of 'sleepy' batteries.

By Isidor Buchmann

In the past, one of the main purposes of a battery analyzer was to exercise and restore NiCd batteries affected by the "memory" effect. With today's nickel-free batteries, however, memory is no longer a problem. Lithium-based batteries do not need a periodic discharge; these batteries cannot be restored through cycling when weak.

So, the modern battery analyzer has assumed some new duties. These include the priming of new batteries, performance verification through quick testing and energizing batteries that have fallen asleep due to deep discharge.

Common sense suggests that a new battery should always perform flawlessly, yet many packs fail to meet manufacturer's specifications. With a battery analyzer, incoming batteries can be checked as part of quality control. Packs that perform poorly during the warranty period can be identified and returned for replacement.

The typical life of a Li-ion battery is 300 to 500 discharge/charge cycles or two to three years from time of manufacturing. The loss of battery capacity occurs gradually and often without the awareness of the user. The function of the battery analyzer is to identify weak batteries and weed them out before they become a problem. This task is especially pertinent in a fleet environment. The loss of adequate battery power is as detrimental as any other malfunction in the system.

Troubleshoot short run times

A battery analyzer can also troubleshoot a short run time. This is a common complaint, and multiple causes can contribute to this problem. In some instances, the battery may not be properly formatted when first put into service. Repeated cycling can correct this. Another problem is incomplete charge when charged with the original charger. A battery analyzer can help to compare the capacity when charged with the original charger, to the capacity when charged by the analyzer.

Another common cause of a short run time is high internal battery resistance brought on by use and aging. Many analyzers can measure the internal battery resistance. Some instruments can simulate the load signature drawn by a digital device to verify the run time according to load requirements.

Higher-than-specified power consumption is another reason for short run times. This, however, is mostly related to the way the equipment is being used.

Lithium-based batteries are sensitive to aging. If stored fully charged at elevated temperatures, the battery can deteriorate to 50% capacity in about one year. Similar performance degradations are observed on NiMH batteries when

Buchmann is the founder and chief executive of Cadex Electronics, Richmond, British Columbia, Canada.

used under the same conditions. Although the battery is still considered new, the user will blame the equipment rather than the battery for poor performance. The analyzer can isolate such problems quickly and accurately.

With the increased dependence on battery power, the need for quick battery testing becomes apparent. Various test schemes have been introduced over the years, but none has caught on. Most have inherent problems with accuracy.

The battery needs to be fully charged before testing because different charge levels interfere with the state-of-health readings. Defense organizations invest heavily in quick battery testing, only to come up with textbook methods that require large computers that must build up extensive data banks of reference material for each battery type checked. In addition, the test time is often too long to be practical.

Quick testing

New techniques measure the state-of-health of a battery in three minutes. Cadex Electronics' Quicktest is based on interference technology and uses battery-specific matrices that are derived through a "trend learning" process using artificial intelligence. The ability to self-learn enables the system to adapt to new battery chemistries without having to change hardware.

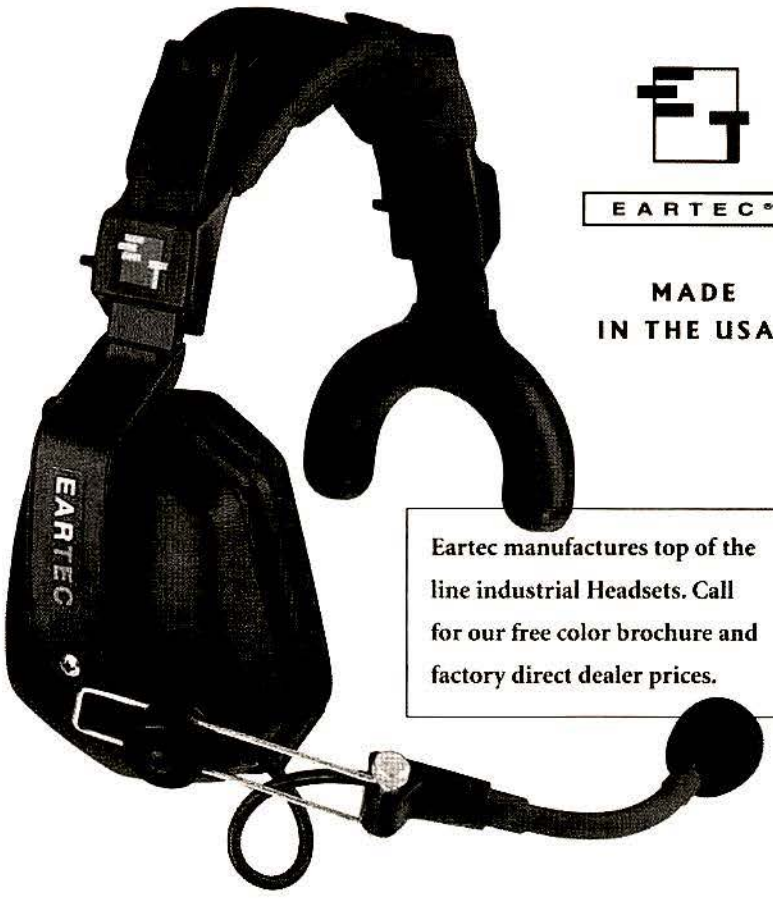
These new techniques can accommodate Li-ion, NiMH, NiCd and lead-acid batteries; the required charge level is 20% to 90%. If outside this range, the analyzer automatically applies a brief charge or discharge. The charge level within this acceptable range does not affect the state-of-health readings.

The matrix obtained through the "learn" function is stored in the battery adapters that also contain the battery parameters to configure the analyzer. One "learn" cycle is the minimum requirement for developing a working matrix. Better results are achieved when *learning* several batteries with varying state-of-health conditions. Once attained, the matrix can be copied to other battery adapters. Testing a battery with a properly learned matrix achieves an accuracy of ±5% on most batteries.

With quick testing, customer service staff can examine batteries at point of sales. Service centers can quickly separate serviceable batteries from those that exhibit genuine defects. A full maintenance program may be needed to repair those batteries that are serviceable.

A common Li-ion battery failure is caused by excessive low discharge. This deactivates the internal safety

Tired of Paying More For Headsets Than You Do For Radios?



EARTEC®

MADE IN THE USA!

Eartec manufactures top of the line industrial Headsets. Call for our free color brochure and factory direct dealer prices.

SERVING INDUSTRY, EDUCATION AND AERONAUTICS SINCE 1961

1.800.399.5994 www.eartec.com

CIRCLE (52) ON FAST FACT CARD

circuit, and the battery appears dead. Modern analyzers can apply a gentle current to energize the battery. (Cadex calls this function "boost.") Once the voltage reaches charging range, a full-service program verifies the battery.

To judge the effectiveness of this program, Cadex tested a large number of supposedly dead Li-ion polymer batteries from various manufacturers. When first measured, these batteries had no voltage and appeared dead. Charging the packs in their respective chargers was unsuccessful. After "boosting," most batteries accepted normal charge. The analyzer applied a full-service program and attained capacities of 80% and higher in most batteries. All restored packs performed flawlessly when returned to service.

Boosting Lithium-based batteries is safe. However, if the cell voltage has fallen to 1.5V and has dwelled in that state for several days, a recharge should be avoided. A deep discharge may form copper shunts in the cells, which can develop an electrical short. The analyzers are supposed to identify such faults and terminate service.

Nickel-based batteries can also benefit from the "boost" program. Older batteries or those with advanced cycle count exhibit high self-discharge, a condition that cannot be corrected. If activated with boost and left unattended, the battery may revert back to its former state.

Connecting batteries

Connecting batteries for testing has been a challenge for technicians and engineers alike. Many so-called "engineering specials" with springs and levers have appeared, only to disappear because of impracticality. This problem can be solved with a flexible adapter.

A flexible-arm adapter accommodates virtually any battery type. By lowering the two arms fitted with contact probes, narrow and awkwardly placed contacts can be reached. Magnetic guides keep the battery in any position, horizontally or vertically.

The flex-arm adapter requires setting the battery chemistry, voltage and mAh rating. The edit key on the battery analyzer prompts the user to enter the specifications. The battery setting is stored in the arm.

To check batteries with quick testing, a common matrix may be used for packs that have similar chemistry, voltage and capacity rating. This applies to cellphone batteries consisting of a single Li-ion cell. If the readings are inaccurate, a separate matrix will be required for these batteries.

QuickBooks® Billing Is Here!

NEW VERSION! 4.0

SHOP Software WARE™ Service

Improved Peachtree® Accounting Integration

Software for the Two-way Communications Industry

The word is out! SHOPWARE is the most cost effective service software available. ShopWare is a full package with no need to purchase separate modules. Peachtree® or QuickBooks® can then complete the billing process - saving an extraordinary amount of time. *Order Yours Today!*

ShopWare Modules Now Include

Service Calls	Freq Groups	SMR Systems
Job Tickets	Frequencies	Security
Projects	Signalling	C/R Contracts
Radios	Depot	M/A Contracts
Fixed Sites	Contacts	Twr Contracts
Fixed Equip	FCC Licenses	Time Sheets
Inventory	Parts Order	Rentals

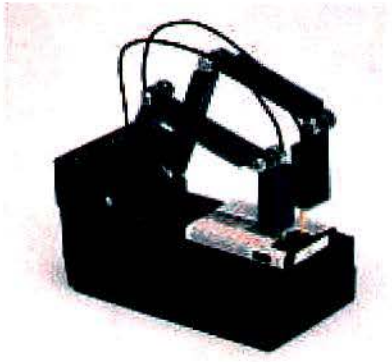
Visit our web site or call for more information and a free demo

800-458-3410
http://www.chargeguard.com

ChargeGuard, Inc.
400 Highland Avenue
Altoona, PA 16602

CIRCLE (53) ON FAST FACT CARD

VISIT US AT IWCE, BOOTH 17027



This flex-arm adapter establishes contact by lowering the arms to the battery. Magnetic guides keep the battery in position. (Cadex 7000)

The flexible-arm adapter is best suited for technicians dealing with constantly changing batteries. However, large groups of identical batteries (fleet environment) are best served with custom adapters. These adapters are programmed at the factory and do not require setting of battery parameters.

With batteries flooding the market, the availability of suitable equipment to test them may outpace battery production. This void is especially apparent in the mobile phone market, where large quantities of batteries are being returned under warranty. Many of these presumably faulty packs are discarded without checking or attempting to restore them. In the end, the customer will pay with higher prices.

Testing and restoring batteries has become a complex assignment. Battery analyzers must be simple to operate and must also allow customer service staff to perform the task without much training. Properly used, these instruments will assist in managing the influx of returned batteries. The quick-test feature can sort packs that are serviceable from those that exhibit genuine defects.

Battery testing also serves public safety organizations, rental outfits and defense organizations. With the quick-test feature, a battery can be examined prior to releasing to a customer or assignment for a critical mission. Testing by applying a full charge and discharge cycle is impractical. Being able to verify battery performance on the fly, only those packs that are fit for the job are released. ■

This article contains excerpts from the second edition book, *Batteries in a Portable World — A Handbook on Rechargeable Batteries for Non-Engineers*. The 300-page book is available from Cadex Electronics through book@cadex.com, or 604-231-7777 or most bookstores. For additional information on battery technology visit www.buchmann.ca.

Receive Weather Alerts Automatically

on your 2-way radio system, PA system, voice-mail, numeric pager or telephone!

- Rack-mount and mobile systems
- Warnings digitally recorded for DTMF access and playback
- Designed specially for demanding Public Safety use

Call toll free 1-888-877-8022 or visit our Web site at: http://www.thuneagle.com

NOAA Weather Radio

THUNDER EAGLE, INC. Wireless Alerting Systems

U.S. Patents 5,444,433 - 5,574,999 - D,377,795

CIRCLE (69) ON FAST FACT CARD

SiteSafe™. RF Expertise and Real-World Experience... all under one roof.

There are a lot of firms out there offering RF Engineering Services these days. But RF Safety and Compliance is too important to risk to some fly-by-night operation. Trust the people with proven RF expertise and real-world experience... SiteSafe.

Our RF Engineering team has the depth of experience and breadth of skills that the big boys can't match. And we continue to set the standard for consistency, quality, and value in RF Safety Training, RF Compliance, AM Detuning, Frequency Coordination, and Drive Testing.

Find out why the world's top wireless businesses rely on SiteSafe RF expertise and real-world experience to make their sites safer, signals surer, and services superior.

Call 800.441.0034 for your free brochure. Or visit us on the web, www.sitesafe.com.

All products or company names listed are Registered Trademarks and Trademarks of their respective holders.

There's maybe one guy in the whole world with more rooftop experience than a SiteSafe RF engineer.

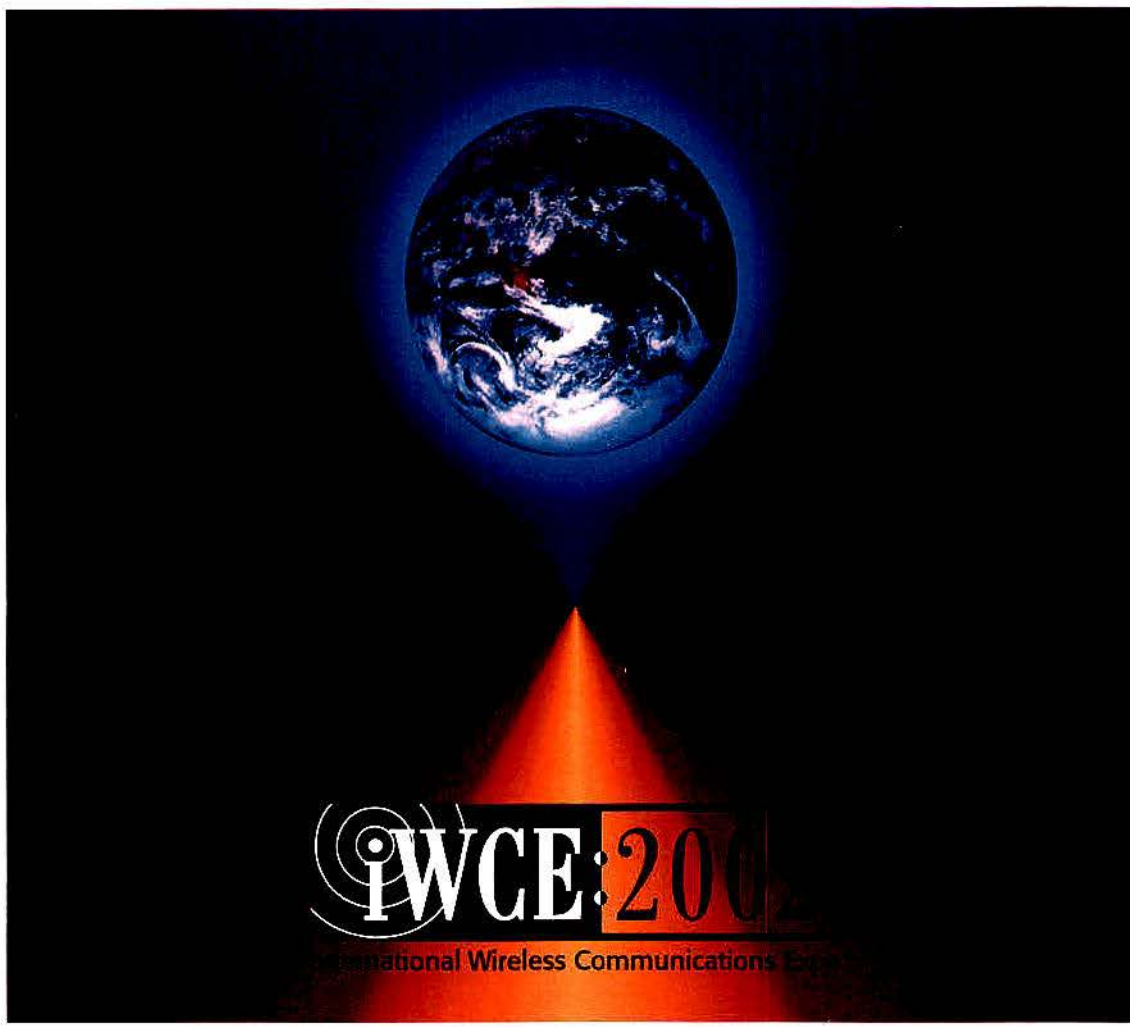
Sitesafe

RF Expertise. Real-World Experience.

800.441.0034
www.sitesafe.com

CIRCLE (54) ON FAST FACT CARD

COVERING THE MOBILE COMMUNICATIONS SPECTRUM



APRIL 24-26, 2002

LAS VEGAS CONVENTION CENTER

LAS VEGAS, NEVADA USA

Interested in attending the
Public Safety Track?
Call 1-800-288-8606 or +1-303-741-2901

For exhibiting opportunities,
Call Mike Doolittle, Sales Manager
at +1-720-489-3137

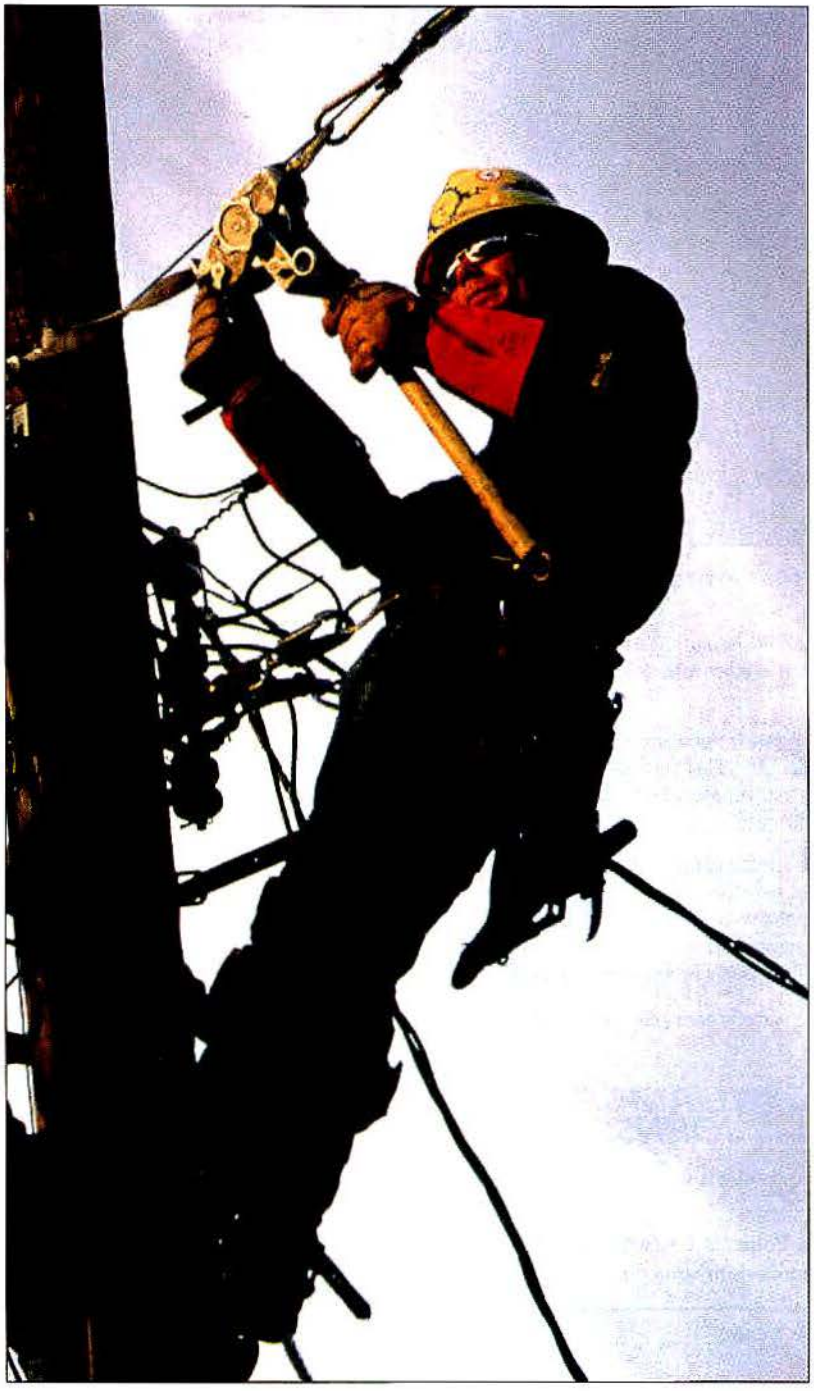
www.iwceexpo.com

MANAGED AND PRODUCED BY:
PRIMEDIA Business Exhibitions

SPONSORED BY:
MRT MOBILE RADIO TECHNOLOGY
RFdesign.
SITE

In defense of 800MHz private radio

Finding Nextel's 800MHz reallocation proposal to be 'retaliatory' toward utility companies, American Electric Power explains why Nextel should be held accountable for resolving interference between Nextel systems and public safety radio systems.



By Don Bishop

Covering 200,000 square miles in 11 states with 258 repeater sites, the private trunked radio system operated by American Electric Power, Columbus, OH, is one of the largest in North America. AEP has estimated the value of its wireless communications infrastructure at $100 million.

AEP uses the radio system to support construction and maintenance associated with its 38,000 miles of electrical transmission lines and 186,000 miles of distribution lines that serve more than 4.8 million customers. The company generates 38 billion watts of electricity in the United States.

Large companies with private radio systems normally reserve their political capital to fight battles affecting their core businesses. Congress and regulatory agencies hear from utilities about financial deregulation and environmental questions. Steel companies lobby legislators about tariffs. When it comes to making a case before the FCC, they don't throw their weight around as much as some radio communications industry associations would like.

When Nextel Communications, Reston, VA, asked the FCC to reallocate spectrum from 700MHz to 2.1GHz in a way that would disrupt private radio users in the 800MHz band and lay upon them a huge expense for reconfiguring or replacing their systems, it roused AEP.

Bishop is editorial director. His email address is *dbishop@primediabusiness.com*.

David B. Trego, vice president of telecommunications at AEP, said that AEP has been engineering and operating land mobile radio systems for more than 50 years. The company built its 800MHz system in the past 10 years. It continues to engineer improvements to the system and expects to add 20 base stations within the next two years.

The complex radio network that offers advanced wide-area voice and data communications services to mobile, portable and base station radios is "not a simple patchwork," Trego said.

Although AEP recognizes the importance of public safety LMR communications systems, the company has asserted that utility-owned LMR systems are also critical to the safety and welfare of the general public. Trego wrote in a letter directed to FCC Chairman Michael K. Powell that utility LMR systems are used to dispatch workers in the repair of facilities and restoration of electric service and to coordinate the daily operation of electrical transmission and distribution systems.

Trego pointed out that without proper and timely coordination of operations, restoration and repair functions, communities that utilities serve could be negatively affected. Moreover, LMR systems enhance worker safety in some of the harshest and most dangerous working conditions.

Nextel, meanwhile, has attempted to partner with utilities or to persuade utilities to use Nextel for utility dispatching functions with "very little success," Trego said. AEP, for example, finds that it must operate a private radio communications network to meet the safety and operational requirements of the electric utility business. Commercial wireless networks are not an

WHEN PRODUCTIVITY COUNTS

Your mobile workforce never stops. It can't afford to. There is always work in the field that needs to be done...now.

And just when it seems that your entire fleet is simultaneously on the move, that's the time when you can most depend on Gamber-Johnson. With nearly fifty years of experience, we know what matters most to our customers.

We provide mounts that are modular to create a comfortable vehicle workspace and allow for easy transitions through multiple vehicle and equipment upgrades. And, all of our products endure even the roughest driving environments while helping prevent unnecessary downtime.

Heavy-Duty, Versatile Mounting Systems

We offer a complete line of mobile mounting solutions, docking stations and services to solve your particular needs. You can always count on Gamber-Johnson to help you navigate obstacles when it comes to innovation on the move. Trust us...we've been down that road before.

It's simply a matter of having the right connections.

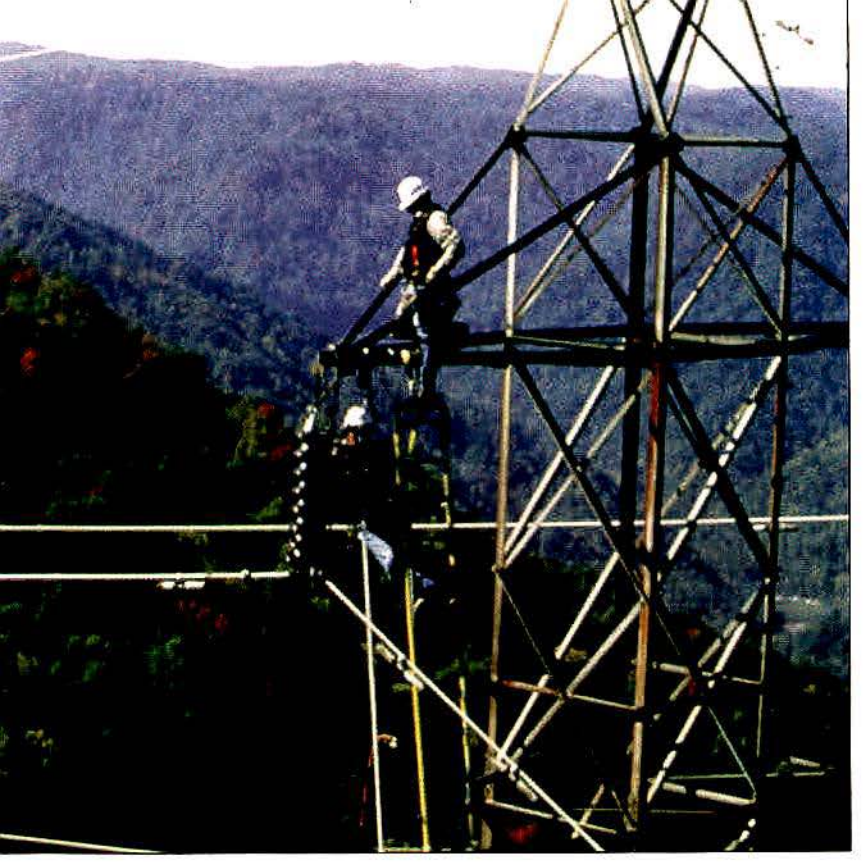
GAMBER JOHNSON

Very Well Connected™

Stevens Point, WI • 800-456-6868

www.gamberjohnson.com

CIRCLE (56) ON FAST FACT CARD



Trego

ence caused by their operations." Trego cited FCC regulation 90.173-(b), which requires licensees to take reasonable steps to avoid creating harmful interference, and he referred to precedent in placing responsibility on Nextel to fix interference that its operations cause to other licensees even when its operations fall completely within its authorized channels.

AEP wants the FCC to hold Nextel solely accountable and not to divert the responsibility by forcing business and industrial/land transportation

Critical to the safety and welfare of the public, utilities must have reliable communications when working to maintain or restore electric power.

AEP Facts

Some facts about American Electric Power's 800MHz radio communications system as of Jan. 2, 2002:

- ❑ One of the largest private trunked radio systems in North America
- ❑ Covers 200,000 square miles in parts of 11 states
- ❑ 58 trunked radio sites
- ❑ Exceeds original design criteria of 90% availability over 90% service territory (200,000 square miles)
- ❑ 132 integrated computer dispatch consoles
- ❑ 7,256 mobile units
- ❑ 3,889 portable radio units
- ❑ 601 mobile data users

option because of limitations related to coverage, availability, reliability and wide-area dispatching.

Referring to Nextel's failure to attract utility business and the fact that its reallocation proposal would offer no compensation to non-public safety entities that would be forced to relocate to other frequency bands, Trego said, "One could view Nextel's proposed realignment as retaliatory in nature."

Trego characterized the proposal as "nothing more than a veiled attempt by Nextel to sidestep their responsibility to resolve interfer-

Visit our Website at www.cookscom.com

FleetStat AVL

Integrating Voice Dispatch, AVL, and Mobile Messaging in one Economical Unit

- Real time GPS vehicle tracking
- Complete dispatch and mapping software
- Vehicle recording and playback features
- Increased system revenues

Fresno, CA ■ 800-233-8818

CIRCLE (57) ON FAST FACT CARD

RF CONNECTORS
Phone: (800) 233-1728
Fax: (858) 549-6345
email: rfi@rfindustries.com
www.rfindustries.com

FREE Cable Assembly Catalog

Call for your **NEW FREE** RF Connectors 128 page catalog **offering nearly 60,000 stock cable assemblies** featuring the RF Connectors line of high quality coaxial connectors, solid center contacts, dual-wall tubing for strain relief and fabrication using only US manufactured coaxial cables. This product line also includes USB, fiber optics and other molded cables. **More than 12,000 variations** of standard connector interfaces terminate 64 popular coaxial cable types to create this broad selection. Custom assemblies are also available with short lead times.

CIRCLE (58) ON FAST FACT CARD

systems to move to frequencies in the 700MHz and 900MHz bands.

"Such a move by AEP would be extremely costly as well as enormously disruptive to ongoing utility critical operations," Trego said. He explained that it would require replacing all radio equipment on the AEP network, including mobile and portable units and base station components such as repeaters, combiners, antennas and tower-top amplifiers.

Even moving to another portion of the 800MHz band would be an enormous logistical task of retuning and reprogramming a large number of radios dispersed over a large geographical area while trying to maintain normal utility operations, Trego indicated.

A string of ceramic insulators are being replaced on the tower of a 765kV transmission line.

Trego didn't overlook Nextel's suggestion that business and industrial/land transportation radio communications system users that relocate to the 700MHz or 900MHz bands should be forced to contribute to a fund to help to pay for the relocation of public safety radio system users. "Completely unacceptable" is how he described it. "The cost of correcting harmful interference should be borne by those causing it, not those experiencing it," he said.

That Nextel would reap a windfall in the form of contiguous 800MHz spectrum next to the cellular band and 10MHz of spectrum next to the PCS band at 2GHz wasn't lost on Trego, but he pointed out that Nextel hasn't publicly acknowledged the pot of gold. It's worth "far more than the $500 million they are offering" to relocate public safety, he said.

Moreover, Trego said that Nextel's windfall would be paid for by taxpayers who would fund the public safety relocation costs and by consumers through higher prices of goods and services provided by business and industrial/land transportation licensees when they pass along their relocation costs.

Besides the financial effects on business and industrial/land transportation radio users, Trego said

A SIMPLE COMMUNICATION SYSTEM FOR HIGH NOISE AREAS

Communicating clearly and protecting your hearing in high noise areas is as easy as 1 2 3. Enhance the performance of your **Two-Way Radio** in loud noise by adding one of our **Noise-Attenuating Headsets** and **Radio Adapter Cords.**

- High quality, rugged Noise-Attenuating Headsets with Certified Noise Reduction Rating (NRR) of 24 dB.
- Over-The-Head or Behind-The-Head style for use with safety caps, helmets, etc.
- Boom-mounted or Throat microphones.
- Voice-Activated (VOX) or Push-To-Talk systems.
- Adapter Cords for over 300 Two-Way Radio models.

For more information and a **FREE demonstration,** call toll-free: **1-800-900-3434**

U.S.A. Quality

David Clark COMPANY INCORPORATED

360 Franklin Street, Box 15054, Worcester, MA 01615-0054 U.S.A.
TEL: (508)751-5800 E-Mail: sales@davidclark.com FAX: (508)753-5827

©1997 David Clark Company Inc. T-4

CIRCLE (59) ON FAST FACT CARD VISIT US AT IWCE, BOOTH #15056

Other 800MHz private radio users

In a letter to FCC Chairman Michael Powell, several associations expressed their opposition to a forced relocation of their systems to other frequency bands. The assocations were:

- Aeronautical Radio, Inc (ARINC)
- American Petroleum Institute
- American Association of Railroads
- Forest Industries Telecommunications
- Industrial Telecommunicaitons Association
- United Telecom Council

They cited a sampling of 800MHz systems that would be forced to absorb the relocation costs—in excess of $350 million. The associations suggested that the relocation cost to all displaced 800MHz incumbent private radio users would exceed several billion dollars.

- *Federal Express* — FedEx has spent more than $100 million for its nationwide 800MHz internal communications system used to coordinate its package-delivery couriers, to provide maintenance and security ground support to aircraft, and to assist in the loading and unloading of aircraft and trucks. The system supports more than 40,000 mobile units and 750 base stations. A replacement system in either the 700MHz or 900MHz bands would cost FedEx an estimated $100 million or more.
- *ARINC* — ARINC, Annapolis, MD, has constructed a new digital service at nine airports using Motorola's IDEN technology. The new system is integrated with ARINC's existing nationwide and global communications networks to support all ground operations, including baggage handling, maintenance and airport security. The company plans to install the system at all of its major domestic and international airports. It has already spent $13 million for its digital system, which could not be retuned to operate in either the 700MHz or 900MHz bands. ARINC further estimated that it has $1 million in embedded invested infrastructure at each of the remaining top 50 airports. Each system supports 3,000 to 5,000 mobile radios, which cost $600 to $1,000 each. ARINC estimated the full cost of relocating the 800MHz systems at more than $160 million.

The letter emphasized that the costs would be imposed on users who are not causing interference to public safety systems and who have assumed additional safety-related responsibilities since Sept.11, 2001. "Indeed, the protection of critical infrastructures, which has been a significant focus of recent Congressional and the Executive Branch activities, is an effort that would be seriously harmed through the implementation of this proposal as submitted," the document reads.

The associations expressed concern that Nextel is trying to unfairly solve an interference problem of its own making at the expense of private wireless users. They pledged to work with public safety radio system users, Nextel and the FCC to help to resolve cases of interference. But they want a more balanced and equitable solution that would recognize that "a wholesale disruption to 800MHz private wireless systems would threaten the U.S. economy and the protection of its workers and citizens." ■

that Nextel's plan has other flaws. For example, Nextel does not hold licenses in the 700MHz and 900MHz bands in all parts of the country, including parts of AEP's service territory. Also, where TV stations have analog-broadcasting facilities on 700MHz frequencies licensed to Nextel, those frequencies won't be unencumbered until the stations shut down those operations in favor of their new digital channels. That transition may not be completed until 2006 or later.

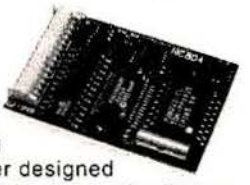
At 900MHz, the FCC requires operations on 12.5kHz channels, but AEP uses 25kHz channels at 800MHz. A conversion would reduce its mobile data system throughput.

Washington telecommunications attorney and *MRT* regulatory consultant Robert H. Schwaninger Jr. said that Nextel "is finessing the fact that it has failed to construct any facilities on either 700MHz or 900MHz channels" as required to maintain its license under the terms of its authorizations. "Therefore, Nextel has not 'perfected' its title to those channels, which it would use as trading stock," he said.

Those additional considerations aside, Trego said that the main point is that Nextel alone should be called on to correct the interference, not the 800MHz business and industrial/land transportation radio system users. "Any plan that would shift the burden away from Nextel would not be in the public interest and would set a dangerous precedent for the future," he said. ■

VOICE Plus
ENCRYPTION
SCRAMBLER
MODEL NC804

$129.95
(1-9 pcs.)



The Model NC804 is a micro-miniature voice-plus pseudo-random rolling code scrambler designed to provide high level security for two-way radio voice communiction systems. It's unique digital encryption processing algorithm, plus it's many features makes the Model NC804 a perfect cost effective solution for high-end voice encryption scrambling for commercial users, police departments, public safety organizations and other systems as a defense against unauthorized interception of private and sensitive voice transmissions by casual or even the most determined listeners. The Model NC804 features 8 user code keys with over 20 trillion codes to choose from. Kill disable for stolen or lost radios, over the air programming for changing of units operating parameters without removal from radio. Measuring .90" W x 1.30"L x .22"H, the Model NC804 supports limited space applications and is plug compatible with our popular Model NC802 voice inversion scrambler making it ideal for system upgrades.

• OVER THE AIR PROGRAMMING
• SCRAMBLE/CLEAR MODES
• AUDIBLE ANNOUNCER
• VISUAL INDICATOR
• INTERFACING
• SYNCHRONIZATION
• CODE KEY MEMORIES
• SYSTEM PROGRAMMING
• VOICE QUALITY • COS MODE
• KEY CODES • KILL FUNCTION

For Detailed Specifications or Product Catalog contact us by Email: info@norcommcorp.com or our website: www.norcommcorp.com

NORCOMM™
DATA SIGNALLING PRODUCTS

530-477-8400
800-874-8663
15385 Carrie Dr., Grass Valley, CA 95949 USA

CIRCLE (60) ON FAST FACT CARD

PRYME's focus is on growing

PRYME Radio Products, located in Brea, CA, was founded in 1995 as Premier Communications Corp. Initially, the company's main focus was on replacement antennas for hand-held and mobile radios, mostly in the amateur and consumer/hobbyist radio markets.

Shortly thereafter, the company expanded its product line by adding aftermarket audio accessories, replacement battery packs and even its own line of two-way radio equipment under the ADI brand name.

In 1998 the company changed its name to PRYME Radio Products, integrating all of its previous brand names. This was done to prevent confusion and also to reflect a new focus on the land mobile, business and industrial, and public safety markets.

"It's true that we started out importing antennas from Taiwan to the United States," said Ken Collier, marketing manager of PRYME Radio Products. "However, we recognized the demand for other accessory products, and we had the engineering and factory partnerships to make them happen. Eventually, the audio accessory side of our business really took off and has become our primary focus."

Pryme's present and future

Today, PRYME has about 20 employees and an annual sales volume of about $3 million domestically. The company's main focus is now on audio accessories, including remote speaker microphones, surveillance kits and audio adapters. The company also derives a significant amount of income from aftermarket battery packs and a line of consumer (GMRS) radio equipment.

PRYME has its own manufacturing companies in Taiwan and China, as well as strategic partnerships with a number of manufacturers throughout Asia. These partnerships allow PRYME to bring competitive products to market and to quickly update designs. Asia (particularly Taiwan) is uniquely suited to provide high-tech products at reasonable cost. This has allowed PRYME to come to market with products that are innovative and affordable, fitting a unique niche in the marketplace.

Recently, PRYME has begun a relationship with Taiwanese-based battery manufacturer AXTECH Inc. that will allow the company to make a large push into the U.S. two-way radio replacement battery market. AXTECH Inc. is an international company specializing in the design and production of batteries for two-way radio communications, cellular, cordless telephones and more.

PRYME grows as an OEM

Recently PRYME has made a significant push into the OEM field, providing private labeling and custom products for several other companies in the United States and abroad. PRYME is producing products for other companies with a custom brand name on the product. These are either modified versions of PRYME products or unique custom products made specifically for the other company. PRYME has been working on OEM projects for the last year.

"We began to focus on OEM accounts at IWCE 2001," said PRYME OEM project manager Michael Houts. "We've had some success over the last year, including several large accounts. Two well-known two-way radio companies are using us to produce remote microphones for their APCO 25 portables, and we are also creating several models for another audio product company. This side of our business should continue to grow."

Pryme products

❑ The Acoustic Tube Surveillance Kits are one of the company's proudest products. This includes the current SPM-1000 model and the new SPM-2000, which will be released around the time of the International Wireless Communications Expo this year. The kits are similar to the ones produced by other manufacturers, but are even more affordable. They are modular and can be expanded from a simple "listen only" earphone kit.

PRYME offers PTT and microphone accessories that allow the kits to be used for true two-way communications. The SPM-2000 offers a few new earphone choices other than just the clear acoustic tube.

The main difference between the SPM-1000 and SPM-2000 is the duty cycle. The SPM-1000 is more of a light/medium duty audio kit. The SPM-2000 is more heavy duty, and is suitable even for the public safety market.

❑ PRYME's most unique product would be the SH-168 belt-clip system. This unit replaces the belt clip on most hand-held radios or holsters. It secures to the back of the radio with screws and strong adhesive. The SH-168 is made of polycarbonate for durability. It locks to the user's belt and the radio locks in place. The radio can only be removed by rotating it 90°.

Pryme's focus narrows

PRYME's focus is to be the premier aftermarket accessory company in the two-way industry. It is the company's goal to be the number-one industry source for audio accessories, battery packs, chargers, antennas, protective cases and any other kind of accessory that finds itself "in demand."

"At the moment we are concentrating on growing the audio line and improving our quality processes to bring ourselves in line with some of the larger manufacturers," said Collier. "Before the end of the year, we'll be making a big push with our battery packs and charger line. As we get each facet of the business established, we'll be launching the next phase."

PRYME Radio Products ■ 480 Apollo Street, Suite E ■ Brea, CA 92821
Tel: 800-666-2654 ■ www.pryme.com
ADVERTISEMENT

Belt clip locks in place

The SH-168 belt clip from **PRYME Radio Products** replaces the standard belt clip on most modern two-way radio transceivers. Unlike traditional belt clips, which can slip off a belt resulting in a damaged radio, the SH-168 locks in place and the radio can only be removed from the user's belt by rotating it 90° and lifting up. The belt clip can also be used with Velcro (not included) as a radio holder for an automobile or base station.

High-powered communications

PRYME's ClearConnect GMRS offers a range of up to 25 miles. Unlike FRS radios, which have a limited range, these radios are helpful when you need long-range personal communications. Upgrading FRS users need not worry about compatibility because channels 1–7 on the ClearConnect are the same as FRS channels 1–7, enabling the portable to intercommunicate with any FRS radios in the area.

Headset adjusts for comfort

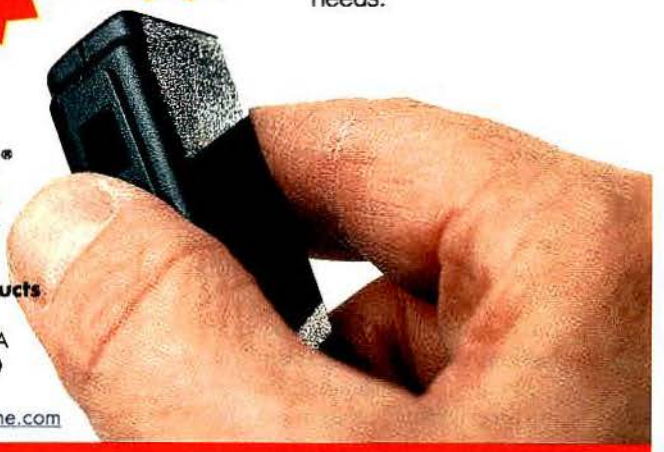
The SPM-400A series of headsets from **PRYME** include an in-the-ear speaker and a rubber-covered earloop design that adjusts to comfortably fit either the right or left ear of any user. The entire headset/speaker assembly is made of durable polyurethane and rubber. The unit features an in-line PTT switch that can be clipped to the user's lapel or belt, or the unit can be keyed remotely using an optional remote cord.

Audio Products
for two-way radios

PRYME Radio Products™ offers a full line of audio accessories for two-way radios, including remote speaker microphones, mini-boom mics, throat mics, earphones, surveillance kits, and other types of audio accessories. We have a range of products available for light to medium duty industrial and public safety applications and models that are compatible with most major brands of portable radio, including Motorola, Kenwood, Icom, and Vertex/Standard, just to name a few. More than just offering microphones, we offer solutions for your audio needs.

Go to: pryme.com/IWCE **for more info**

Special IWCE Offer for Two-Way Dealers



PRYME®
Radio Products

PRYME Radio Products
480 Apollo St., #E
Brea, CA 92821 USA
Phone: 714-257-0300
Fax: 714-257-0600
Web: http://www.pryme.com

CIRCLE (61) ON FAST FACT CARD

ADVERTISEMENT

Remote-control voice-over-Internet protocol

Replace a $100,000 switch with a $1,000 PC? It's a possibility with a remote-control VoIP that extends dispatching to PCs with wide-area computer network or dial-up access.

By Don Bishop

It's a new ball game for the Midland brand of land mobile radio products. The focus is on Midland Radio's remote-control, voice-over-Internet protocol (remote-control VoIP) product. But the Midland story demands an update.

Former Motorola executive Tony Lane, known for helping to develop Motorola's dealer program beginning with the Radius product line, heads Midland Radio, a U.S. affiliate of CTE International, Reggio Emilia, Italy. As senior vice president and chief operating officer, Lane directs Midland Radio's Consumer and Professional Divisions.

The Professional Division was created last year when Midland Radio, Kansas City, MO, bought the FM two-way radio land mobile sales and distribution business owned by Securicor Wireless. That's the same sales and distribution business once owned by Midland International and previously known as Midland LMR.

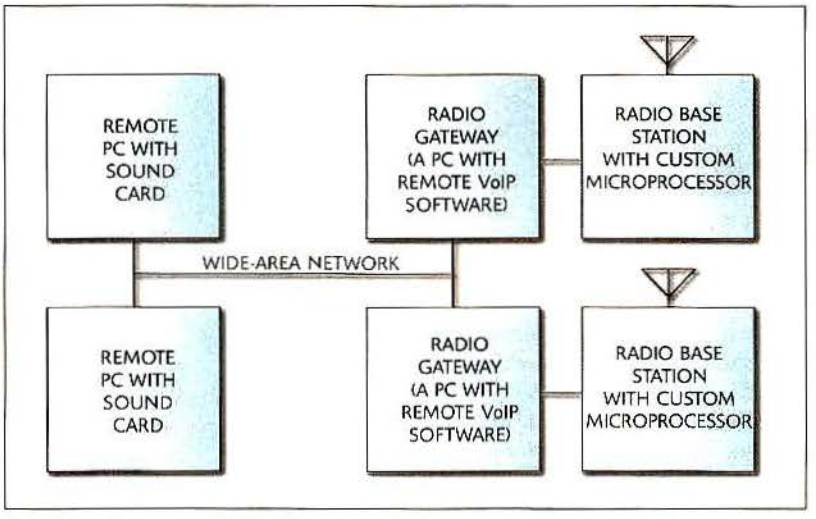
No connection exists between the old Midland International and Midland Radio, nor between Securicor Wireless and Midland Radio—except for trademark licenses from each that allow Midland Radio to use the Midland brand name for consumer and land mobile radio products. Nonetheless, many Professional Division employees have made transitions from one owner to another and have worked on the land mobile radio product line for many years.

Ownership of the land mobile radio product line has changed several times during the past 10 years, and it seems to have landed squarely in the hands of a European company with extensive mobile radio experience and business operations dating to 1973. In fact, the Professional Division called on its Eastern European affiliates for engineering services in connection with its latest U.S. radio transceiver product introductions—a step that the Professional Division's engineering director, David Kingsolver, said has reduced engineering costs to 5% to 10% of the previous typical outlay.

Meanwhile, Kingsolver and Lane expressed enthusiasm for the remote-control VoIP. For one thing, the remote-control VoIP gives users unprecedented and flexible access to a radio system backbone. Take, for example, a federal agency with repeater sites in remote areas that otherwise can be accessed only by local control stations. (A control station is a radio base station with a signal that can reach the repeater.)

The agency's wide-area computer network connects many of the offices with the control stations. But microwave or other backbone systems connect only a limited number of the repeaters with one another. When users are beyond the coverage of the backbone network available to dispatchers, they can't be called by using the control stations directly or by using traditional radio remote controls connected to the control stations.

The Professional Division developed special firmware in its base station radio's central processing unit (the CPU, or computer brain) to optimize its connection with a gateway computer. The gateway computer serves to connect the radio base station with a computer



Special software on a PC with a sound card can be used for voice access to and remote control of radio base stations through radio gateway PCs. The gateway PCs also have special software, and they connect through a custom microprocessor in the base station.

Bishop is editorial director. His email address is *dbishop@primediabusiness.com*.

wide-area network, which in turn serves as a backbone to connect any PC on the network with any selected base station with a gateway. Result: immediate connectivity among all gateway base stations.

Besides extending existing local dispatching capabilities to a new network of base stations, remote-control VoIP gives access to users who never had it before. They can use PCs to place calls with dial-up service from desktops or from laptops while on the road. They can dispatch from out-of-state offices and create zone dispatch centers.

Selective calling allows the remote-control VoIP to call an individual, distant radio unit over the WAN. Various methods can be used, including CTCSS, DCS and five-tone Selcall.

A software package has to be installed on any PC intended for use with remote-control VoIP to allow communication via IP packets directly with the gateway computer, which then converts the packets into analog voice or control signals. Off-the-shelf sound cards and digital controllers plug into the PC to allow it access to the remote radio base station over the wide-area network.

Intelligent scanning

The Professional Division's firmware optimization allows the remote PC to control as many as 64 channels over IP, together with "intelligent scanning," which stops the radio on a channel and displays the selection on the remote PC. A binary output from the radio gives the computer the channel information, and a status signal tells the PC when to read the data lines.

Kingsolver explained that if a PC is scanning several base stations and one is operating at a remote location, it helps the PC user to know which user group has been selected when the scanning stops on a channel.

He said that scanning is a common requirement that couldn't be done cleanly over tone line or dc termination connections used by traditional remote controls because it was difficult to transfer the scanning information.

"In land mobile radio, and especially in public safety radio systems, scanning with mid-tier radios is one of the biggest and toughest criteria to meet. It's common for public safety and government agencies to want fast scanning, priority sampling and sometimes dual-priority scanning," he said.

Kingsolver said remote-control VoIP has its greatest appeal to users with wide-area computer networks. He mentioned state agencies with many base stations, each with its own centralized dispatch. "We can give them the capability of anyone on the state network communicating with any one of those base stations," he said.

If disaster strikes

Moreover, if weather, fire, flood, seismic activity or violence should disable a dispatch center, any location with a PC can take over the radio communications network. "You can distribute dispatching as much as you want or need," Kingsolver said.

Kingsolver said that remote-control VoIP soon would be a large part of the land mobile radio business, and Lane added that many companies in the private sector have offices in many locations, each with on-campus radio systems that could be connected with remote-control VoIP through their existing wide-area computer networks.

"The effect upon traditional dispatch technology, whether trunked or conventional, may be substantial," Kingsolver said. "What this really allows in the networking realm is to do away with a $100,000 switch and use a $1,000 PC with appropriate software to replace the switch."

What about sales opportunities for dealers? On the one hand, they may not be selling additional two-way radio control stations onto existing systems. But Kingsolver said that the technology should stimulate sales because it "dramatically" increases the capability of two-way radio. "Customers can get wide-area coverage with a small investment in infrastructure," he said. ■

Midland Radio

Midland Radio employs about 50 people and sells its Professional Division's land mobile radio products to dealers and direct to some key customers. It also uses land mobile radio manufacturer's representatives to augment the company's regional sales managers.

Lane

The company's chief operating officer, Tony Lane, came to the company last year after 28 years with Motorola where he helped to start that company's dealer channel. It's that very channel that Lane wants to use for land mobile radio sales at Midland.

"We have been using dealers as a sounding board for product development," Lane said. "We have counseled with a number of dealers to make sure we have the right features and pricing. They're smart; they know where their market is for this product. And they are going to lead us, rather than us lead them."

Lane said that Midland's land mobile products always had a strong brand name and customer loyalty, yet the business was decimated during 10 years of ownership changes. He said that a lot of dispatch business still exists, and that the company has rededicated itself to land mobile radio.

"We must rebuild confidence in our dealer network that we can deliver a high-quality product at a good price when they need it, and that we can support them and their customers after the sale," Lane said.

Lane said that the company is looking for the best markets to serve where "we won't get trampled," referring to some large competitors. "LTR still is in big demand. There still are requests for T-band and lowband. No one is paying attention to lowband. Maybe our role is going to be areas where others are not spending lots of time and energy—and where rightly so they shouldn't."

Lane said that the company hadn't put a hard dollar market value on remote-control VoIP, but that Midland, its customers and dealers see it as "huge."

"Think about the Internet for a minute," Lane said. "There's no reason to think that the Internet won't do to the radio communications world what it's done for everyone else's world. It's the most marvelous tool." ■

220MHz: The enigma

Despite the fact that the 220MHz band had a lot of potential when it was first authorized by the FCC, 220MHz enthusiasm and technology development have waned.

By Philip Adler

The 220MHz band showed so much promise when it was first authorized by the FCC. But interest in the 220MHz band, along with a lot of other current technology, is relatively low.

Motorola has announced that it will introduce 12.5kHz-channel equipment for 220MHz use. Although that should spark interest, the company's plan is not a long-term answer. Because the band is segmented into slivers of non-contiguous, 5kHz-wide channels, Motorola's plan requires an inordinate number of *contiguous* slivers to fit its 12.5kHz-channel bandwidth requirements.

The 220MHz band offers SMR operators the opportunity to revive dependable and inexpensive dispatch service that once existed at 800MHz before Nextel.

Once enough 5kHz channels are put together (three or more), spectrum efficiency decreases more than 60%. The answer is either a consolidation of the 220MHz band or the development of a digital format, such as IDEN, that could use 5kHz-wide channels. The contiguous nationwide and E Block channels could accommodate 12.5kHz-wide signals, but, once again, with a substantial loss of efficiency. Didn't the promise of spectrum efficiency prompt the FCC to structure the band as it did?

Problems associated with using the 220MHz band have been many and varied. Two of the three initial narrowband voice equipment manufacturers—Securicor Wireless, Uniden America and SEA—have dropped 220MHz. Bizcom USA, the company that bought the rights to make SEA's former 220MHz equipment, is seeking financing to restart the manufacturing that SEA suspended for lack of funds.

Adler is the owner of PCS Communications, a radio equipment dealership and SMR operator with commercial mobile radio systems in the Philadelphia, Baltimore and Atlantic City, NJ, areas.

Survey the real customers

Neither Uniden, SEA nor Securicor Wireless understood the reality and workings of the SMR industry. All three seemed to think that they knew more of what the operators wanted than the operators themselves. Not one of the three bothered to survey their real customers, so it is little wonder that we find ourselves in the present state of affairs.

The 220MHz products continue to be merely adequate, while UHF and VHF FM product engineering benefits from what was learned at 800MHz before the arrival of Nextel.

For example, when Kenwood Communications entered the 800MHz LTR equipment race, the company's research was methodical. Kenwood representatives visited dealer after dealer in an effort to understand the needs of the SMR operators. They didn't assume that they had the answers, as they first wanted to actually hear the questions. As a result of those efforts, Kenwood developed a superior 800MHz product that has sold extremely well, and whose features are now prevalent in every trunking radio that the company makes.

The 220MHz band offers SMR operators the opportunity to revive dependable and inexpensive dispatch service that once existed at 800MHz before Nextel. A fact that seems to be overlooked by most dealers is that 220MHz operation resembles 800MHz operation in offering a valuable feature—exclusivity.

The same cannot be said of the UHF or VHF bands because there is no guarantee that an operator in those bands would not have to contend with co-channel users and the resulting interference that would surely occur eventually. Granted, there are only 2MHz of spectrum at 220MHz, but even with this bandwidth limitation, the market potential remains significant.

5kHz: A great opportunity

The manufacturer that develops a 5kHz digital product for the band would have a tremendous market position. As an operator with a considerable number of SEA 220MHz systems in place, I can speak from experience that amplitude-companded, single-sideband works, and in fact it works well. It has its peculiarities, but then again, so does everything else, including digital.

Developing digital equipment for these 5kHz channels would be a daunting task, but if a relative flyweight such as SEA could develop 5kHz equipment, certainly a super heavyweight such as a Kenwood or a Motorola should be able to do considerably better.

Imagine IDEN, or a similar digital product at 220MHz, with a feature such as the Nextel direct connect. It need not have wireless telephone capability; two-way radio dispatch is enough. Excuse my enthusiasm, but how significant would that be for an operator? Should we call it FleetLink, or perhaps NextLink?

Better yet, who cares what it is called, as long as a forward-thinking company has the good business sense to develop it? ■

years of history: *Dispatch Monthly* founder peers in the rear-view mirror

A 12-year-old boy will try to impress his friends. I tried.

My father, Capt. George Burton, was chief engineer for the Contra Costa (CA) Sheriff's Office whose 150-foot KQCE radio tower was his responsibility. The tower was alongside the city's airport, and on that Sunday morning my buddies and I were waiting to take a plane ride. They dared me to climb the tower, so I did.

Burton still has the beacon from the tower he climbed as a boy.

Our family lived on a hill above the town, and my father was looking out the window just then and saw someone on the tower. He called the dispatcher, and then drove to the waterfront himself. From 150 feet up I could hear sirens and see a bunch of red lights. I wondered where they were all going—until they pulled up at the base of the tower.

The tower eventually was moved to a new location, and eventually it became my responsibility. I had a security fence put around it to keep kids off of it. It was a sad day when they replaced the old tower. But I have the top piece with the lights from the old KCQE tower, which is all that's left. Just what everybody needs in their family room, right?

Another time, an early cable TV master antenna was being installed on a hillside above Martinez, CA. It was November 1948, and my father had built the 80-foot tower to hold the antenna. On a cold, windy day, some of his adult friends helped to pull it erect. I was assigned one of the guy wires. I may have tried to wipe my nose on a shirt sleeve, or maybe my hands were just cold. I lost my guy wire, and the tower crashed. I can't say that anyone was impressed.

My father had his own problems. The county's first mobile radios were homemade. The chassis were made from aluminum, and the best source was slot machines. My father gathered a posse of friends and raided a gambling den, seizing a quantity of the machines. They quickly drove them to the foundry and had them melted down for the aluminum, only to learn that they had raided a business owned by the sheriff's brother-in-law.

There was more. A few years later, one of the deputy sheriffs was intoxicated when he arrived for work. My father fired him. Five years later, the man was elected sheriff. The first thing he did was to fire my father. The civil service commission reversed the dismissal on appeal, but it did give my father a 30-day suspension for calling the sheriff "a no-good SOB" following the firing.

George Burton held that job for 32 years. Although I later had the same title and job, there's no way I could ever have matched his contribution to the field of communications.

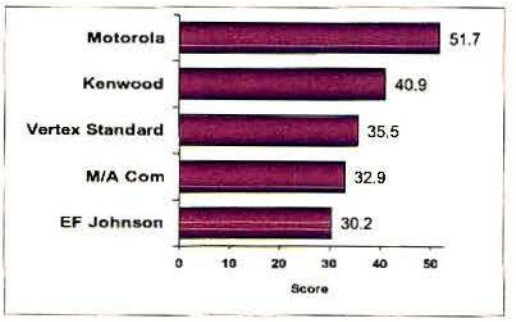
—*Alan Burton*

(Capt. Burton, an editorial advisory board member, is the founder of Dispatch Monthly *magazine. Retired from law enforcement and publishing, he has written a manuscript for a mystery titled* The Amateur Terrorist.)

Motorola tops survey results

The majority of mobile radio manufacturers in North America are being outperformed by Motorola in areas such as high product quality and technical support, according to a survey released by IMS, a specialist market research company based in the United Kingdom.

The survey results released March 27 were based on a detailed questionnaire completed by about



IMS' survey shows Motorola as the best overall manufacturer with a score of 51.7. Sample size: 187.

200 users involved in the purchase of mobile radio products. According to IMS' press release, users gave their opinions on manufacturer performance against various criteria ranging from "competitive price" to "good customer service." Respondents also identified the importance they attributed to these factors when making decisions on the purchase of mobile radio products.

The diagram (from IMS) shows an amalgamation of these results for terminal manufacturers. It was calculated by taking the weighted performance scores against each criterion for each manufacturer and adding them together to give an overall best manufacturer.

"This shows that there was a large gulf in the perceived levels of performance between Motorola and the majority of other companies. The most notable difference occurs in product quality, which users perceived to be the most important factor when selecting mobile radio products," the press release read.

E.F. Johnson project acceptance, product introductions pick up

As financial returns improve for Transcrypt International, Lincoln, NE, orders, project acceptance and new product introductions for the company's E. F. Johnson subsidiary in Waseca, MN, show a quickened pace.

2001 results — Transcrypt posted a $1.5 million profit for the fourth quarter of 2001 compared to a loss of $18.1 million for the comparable period in 2000, a loss that included $12.4 million of income tax expense. The tax resulted from an increased valuation allowance for deferred tax assets. The fourth quarter's revenue was $13.8 million, an increase of $6.6 million over the $7.3 million in revenue for the same period in 2000.

For all of 2001, Transcrypt's net income was $544,000 on $44.2 million in revenue, compared to a loss of $25.4 million on $42.2 million in revenue the previous year.

The company ended the year with cash and cash equivalents of $11.6 million and chose to pay off and terminate its line of credit on Feb. 1, 2002, leaving an unencumbered cash balance of $6.1 million.

"The increase in our revenues was primarily the result of the company focusing its efforts on the public safety sector and governmental user segment of the market, as well as improvement in and introduction of new land mobile radio products," said Michael E. Jalbert, Transcrypt's chief executive. "With continued development and introduction of new Project 25 products and infrastructure equipment in 2002 and the public sector's increasing demand for digital interoperable wireless communications solutions, we expect to see continued improvement in our financial performance in the year 2002."

Orders — Johnson has logged multiple orders for radio communications equipment placed by agencies of the Department of Interior. One order includes 5300 series mobile radios and hand-held controllers for the Bureau of Indian Affairs for use in its nationwide law enforcement activities. In additional orders placed, agencies of the Bureau of Land Management will receive digital 5300 series mobiles. Collectively, the orders are valued at $1.6 million. Jalbert said that the DOI is expected to use the radio equipment in its transition to Project 25 digital communications.

Johnson also won a contract from the school board of Virginia Beach, VA, for combination SmartNet and SmartZone 7780 series portable radios for use by the Virginia Beach City Public Schools. The radio equipment will be used in school buses supporting 84 schools in Virginia's most populous city. The contract was valued at $444,400.

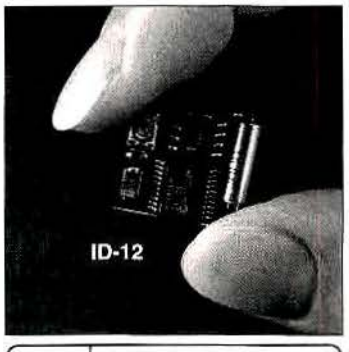
Acceptance — Johnson is basking in the glow of completing an integration project involving its Multi-Net 800MHz trunked radio communications system installed in Chester County, PA. The company upgraded two existing sites to simulcast and added channels to three five-channel sites for a total of 11 channels. As the project was completed, Johnson received an order from Chester County for additional radio equipment valued at $577,000.

"This integration will make the system easier to use and will provide improvement in coverage areas throughout the county," said Ed Atkins, director of emergency services for Chester County. "The quality of support that we receive from E. F. Johnson has been a crucial factor in maximizing the efficiency of our system."

Atkins

Another plus for Johnson is the successful completion of an interoperability test on its 5300 Project 25 trunked mobile radios. Officials from the cities of Phoenix and Mesa, AZ, which are constructing a joint Project 25 trunked radio system, conducted the test to evaluate the capability of the Johnson radios to work on their soon-to-be-installed Motorola system. According to a statement from Johnson, the test result means that

Digital ANI MDC-1200® Signaling



CSC | CONTROL SIGNAL
www.ControlSignal.com

Control Signal's ID-12/1201 is an economical **MDC-1200** ANI system. The ID-12 encoder works in all radios and fits in virtually all handhelds and mobiles. The ID-1201 decodes any **MDC-1200** ANI signal, has a large LED display, a printer port and an RS232 port.

MDC-1200 is a registered trademark of Motorola Inc.

800-521-2203 • 303-989-8000 • Fax 303-989-8003 • www.ControlSignal.com

CIRCLE (62) ON FAST FACT CARD

Johnson is only the second supplier of radio equipment that operates on Project 25 trunking systems.

Multimode portable — In late February, Johnson introduced its 5100 portable radio series that supports multiple protocols, allowing numerous agencies the ability to communicate among themselves with the switch of a button.

Johnson, founded in 1923, provides wireless communications systems for public safety, commercial and government customers. It designs, manufactures, and markets conventional and trunked radio systems, land mobile radio repeaters and mobile and portable radios, including Project 25 digital radio products.

FCC adopts 800MHz NPRM

The FCC has adopted a Notice of Proposed Rulemaking to explore possible solutions to the 800MHz public safety interference problems caused by neighboring commercial providers.

In the NPRM, the FCC stated that the increasing levels of harmful interference to public safety communications in the 800MHz band must be remedied. The commission is soliciting comment on how best to do just that, while minimizing disruption to existing licensing structure. The FCC also seeks comment on a Petition for Rulemaking filed by the Personal Communications Industry Association seeking amendment of Section 90.621 of the commission's Rules. Also in the NPRM, the FCC would like comment on deals with the Balanced Budget Act of 1997. The commission would like comments on the terms and conditions of licenses in the 900MHz land mobile band if it is used to relocate displaced licensees.

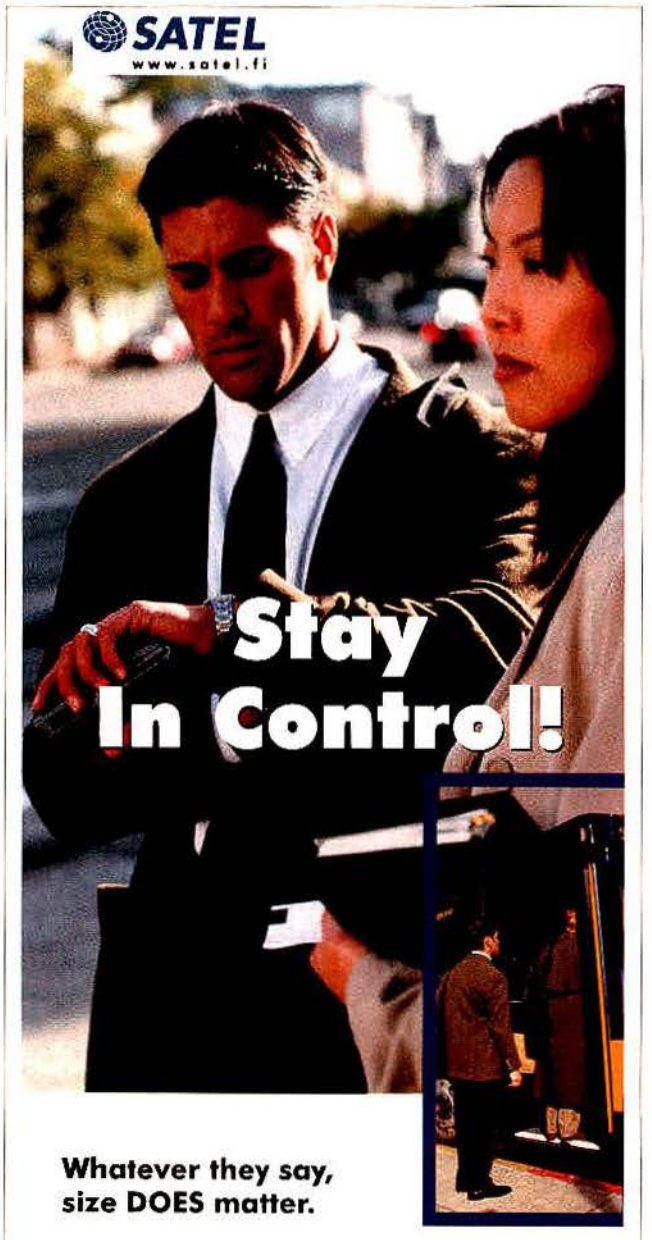
A statement from FCC Commissioner Kathleen Abernathy said she welcomes the decision to adopt the NPRM. The statement said, "Nextel deserves significant credit for coming forward with a proposal. Subsequent to Nextel's initiative, other parties have offered alternative proposals and I hope and fully expect additional ideas will be generated in response to this notice. I look forward to a vigorous and informed debate."

Abernathy also stated she is reluctant to force parties to move at their own expense and that minimizing the disruption to other bands is important.

A statement released by FCC Commissioner Michael Copps said he is also glad the commission is asking for feedback. The statement reads, "In order to do our job well we need to know how much spectrum public safety needs to protect our citizens."

Commissioner Kevin Martin's public statement said he is looking forward to working with Nextel, NAM and the public safety community to better understand and resolve the interference issues.

All the commissioners seem to agree that something must be done to stop the 800MHz interference problem, it's just a matter of what. Whether the NPRM brings about a solution or not, it's sure to spark some interesting discussions.



Whatever they say, size DOES matter.

It's sometimes hard to keep track of things. Managing large fleets scattered around a vast area can be a nightmare. Fortunately SATEL offers you an easy way to stay on top of things. With up to 40 km range and wide compatibility, a SATEL network will fulfil even the most demanding requirements.

In mobile use size does matter. SATEL is the leading manufacturer of radio modems. Our products are lightweight and compact since we value mobility in our design. They are also operator free, which means low operating costs. A network made of radio modems connected to a positioning system enables you to control your fleet precisely the way you want to.

SATEL - Good things come in small packages.

Please contact the distributor in your area:
SATEL Data Radio USA, L.L.C
(In Canada and the US except the states CA, AZ & OR)
Phone: 1-866-738-9858 or 1-423-357-1764
Email: info@satelradio.com
Sartelco USA (for CA, AZ & OR)
Phone: 1-408-973-1740
Email: Sartelco-USA@globe2.com

CIRCLE (63) ON FAST FACT CARD VISIT US AT IWCE, BOOTH #11114

Oklahoma City chooses EDACS for radio system upgrade

Oklahoma City has selected a new 800MHz M/A-Com enhanced digital access communications system to replace its replace 35 separate conventional radio channels. The new installation will support 4,500 radios on 32 trunked channels configured in two overlaid simulcast systems.

Kerry Wagnon, program director for the city's Public Safety Capital Projects Office, administers $90 million worth of improvements approved by voters that include the purchase of vehicles and other apparatus, an upgrade to computer-aided dispatching and the $24.5 million EDACS radio system. A sales tax is funding most of the radio system, with the rest paid by the city's airport, water and utility, and transportation and parking enterprises. They will share the system with other city departments and public safety agencies.

The 28-month deployment period began in January with acquisition and specification development for 11 new repeater sites that will work with a primary site on a 400-foot downtown building.

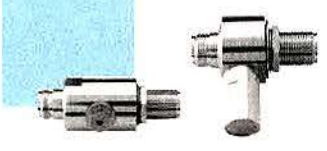
One system uses 18 trunked channels and a tower configuration that concentrates signal power overcome as much as 20dB of obstruction attenuation to penetrate buildings in densely populated areas. Wagnon said that the city preferred achieving in-building coverage with sites rather than bi-directional amplifiers in buildings.

A second, 14-channel trunked system covers the same area but emphasizes rural coverage in the 620-square-mile city. Users will roam from one system to another if coverage from their primary system otherwise would deliver an inadequate signal. Meanwhile, the dual-system configuration offers redundancy.

M/A-Com officials pointed out that together with EDACS systems operated in the state by Oklahoma Gas & Electric and American Electric Power, nearly 90% of Oklahoma would be covered by the city's and the utilities' 800MHz EDACS radio service. Extensive EDACS coverage didn't figure into the city's decision, though. Wagnon said M/A-Com won the contract because the system rated higher on the evaluation criteria with a lower cost.

Moreover, Wagnon said that the majority of the 50 agencies identified in the request for proposal for communications interoperability use VHF and UHF conventional systems. Oklahoma City's neighbors to the north (Edmond) and to the south (Norman) use 800MHz Motorola systems. Placing everyone on a new EDACS system didn't seem feasible.

RADIALL



Radiall/Larsen Lightning Protectors

Radiall/Larsen is proud to introduce our new line of Quarter Wave and Gas Discharge Lightning Protectors. With this new product offering, Radiall/Larsen is your one-stop source for Antenna Solutions.... from our new line of Base Station products to Lightning Protectors.

Call today for a copy of the Radiall/Larsen Antenna SourceBook™ featuring our full line of antennas.

1-800-ANTENNA (268-3661)
Visit our website: www.radiallarsen.com
email: info@radiallarsen.com

RADIALL/LARSEN

CIRCLE (64) ON FAST FACT CARD

ComSpace files Chapter 7 bankruptcy

ComSpace, Coppell, TX, known for its innovative digital-channel, multicarrier-architecture technology, filed for Chapter 7 bankruptcy liquidation in Dallas federal court on March 25. Along with the company's other assets, the technology will be sold by the court.

Venture investors including Sevin Rosen of Dallas and Noro-Moseley Partners of Atlanta had pumped millions of dollars into ComSpace, but by late last year, more financing was needed. An effort to secure more venture funding came close but ultimately failed, and in October, half of the company's 80 employees were laid off.

The company's president, Steven E. Fulford, told the *Dallas Business Journal* that an angel investor agreed to invest $5 million, and Fulford promptly rehired 10 employees. Before the investment could be completed, Fulford's wife, Denise, died of a heart attack, and Fulford took two weeks off. In the meantime, the investor was injured in an auto collision and died of his injuries.

"I would be surprised if the company, under some other name or some other company, is not resurrected and starts fresh," Fulford told the *Journal*.

Chuck Bolash, ComSpace's vice president of sales until the October layoff, said that he and many others were committed to the DCMA technology. "I hope someone will pick it up out of bankruptcy court and do something with it," he said.

By Dec. 1, all but 10 employees had been let go. By the end of March, with bankruptcy looming, the company had virtually ceased operations with perhaps only Fulford and the chief financial officer, David Craig, tending to the office.

The company withdrew from exhibiting at the International Wireless Communications Expo. The ComSpace Web site is dark, and the telephones were scheduled to be disconnected on April 1.

Base antenna withstands harsh conditions

Antenex's family of fiberglass-enclosed base antennas for the 2.4GHz band offers 6dBd gain and has a VSWR of <2.0:1 from 2.4GHz to 2.48GHz. The antennas can be mounted outdoors in harsh weather conditions. The FG series of antennas have the same outer shell design used in the company's lower-frequency fiberglass-enclosed base station family. A high-gloss, heavy-wall fiberglass radome, a finish ground, schedule 80, a gold anodized aluminum sleeve for mounting and a gold anodized aluminum cap complete the durable yet sleek look. On the inside, a rigid, highly consistent and low-loss PC board trace is used to construct the collinear radiator. The product also features a nickel-plated brass N female connector in the base for feedline connection.

WWW.ANTENEX.COM.

Antenna operates with integral ground plane

The ANT150F2 from **Telewave** is a compact, omnidirectional collinear antenna with an integral ground plane, which covers 148MHz–700MHz. The antenna is enclosed in a rugged structural composite radome, with a total height of only 60". The antenna's gain is 2.5dB minimum, with a nominal power rating of 500W. The vertical beamwidth is 30°, allowing RF coverage of low-lying areas such as valleys and canyons. This antenna is useful for replacement of old VHF ground-plane or "J-hook" type antennas. N female or optional 7-16 DIN female connectors are available. The ANT750F2 is a similar antenna that covers the 734MHz–806MHz range. Shadowing and multipath common in the upper UHF bands can be greatly reduced with this antenna. The model ANT750-Y5-WR is a heavy-duty directional yagi antenna that covers 734MHz–806MHz. The gain is 5dBd minimum, with a nominal power rating of 500W. The antenna is coated with Txylan material to eliminate damage from corrosion or abrasion. The active element connection and feedline are sealed inside the antenna boom.

WWW.TELEWAVE.COM

Antenna delivers high-gain performance

Corner-style antennas from **Antenna Factor** are available in models covering frequencies from 800MHz to 2.4GHz. The antennas are designed for long distance, directional communications and enhance the performance of RF links. All models feature high gain, a wide beamwidth, greater-than 70MHz bandwidth and 25dB front-to-back ratio. The antennas are constructed to withstand the stress of long-term use and are designed for 50Ω system matches with a maximum input of 100W.

WWW.ANTENNAFACTOR.COM

Antenna provides flexibility

The XtremeWave MSO24014PTNF all-terrain sectorized omnidirectional antenna from **Maxrad** is designed to provide pattern shaping flexibility to wireless Internet network planners by applying electrical and mechanical technology to a single antenna model. This antenna allows individual sector adjustments of as much as 15° of uptilt or downtilt, permitting system planners to contour their coverage area according to the geographic conditions of the territory. For applications with specific coverage demands, the antenna offers more than 10 azimuth pattern options, optimized to address varying coverage, cost control and tower space limitations.

WWW.MAXRAD.COM

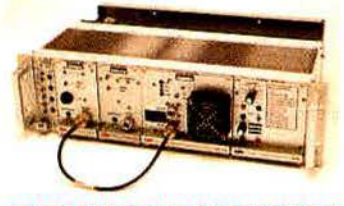
Omni-directional antenna for 5GHz

Mobile Mark's omnidirectional site antennas for 5.2GHz and 5.8GHz are available in 6dBi and 9dBi gain configurations. These high-frequency antennas are designed for new microwave systems, including UNII networking. The design accommodates high-speed wideband performance. The antennas provide a uniform omni pattern and are enclosed in a black polycarbonate radome that measures 18" long and 1" wide. The antenna terminates with a female N connector and comes with all hardware needed to mount it to a pole, ceiling or surface/offset mount.

WWW.MOBILEMARK.COM

FROM ONE EXTREME

TO THE OTHER.



EXTREME PERFORMANCE AND RELIABILITY FROM...

Daniels Electronics Ltd.
Base Stations & Repeaters

- Ultra-low standby current
- Temp. range: -40° F to +140° F
- Rugged Modular Construction

Proven in:

- Antarctica
- Death Valley
- Rocky Mountains
- Numerous Forest Fires

Ideal for extreme conditions

DANIELS® ELECTRONICS LTD.

Call: 1-800-664-4066 or
250-382-8268
Email: sales@danelec.com
Web: www.danelec.com

CIRCLE (65) ON FAST FACT CARD

Antennas combine with subscriber units

Radiall/Larsen Antenna Technologies' line of base station antennas, when combined with existing subscriber unit antennas, are useful for complete broadband wireless needs. The product line includes systems at ISM 2.4GHz and 5.8GHz and UNII 5.2GHz–5.8GHz bands. The product types include solid parabolics, grid parabolics, field adjustable sectors, fixed sectors and one new yagi.

WWW.RADIALLLARSEN.COM

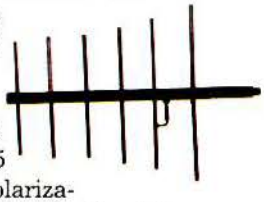
Base station antenna features adjustable tilt

The Optimizer Plus AXE199014 adjustable downtilt antenna from **Radio Frequency Systems** features polarization diversity in addition to the continuously adjustable dial-turn electrical tilt process. The adjustable electrical tilt provides the system operator flexibility for any time a new value of electrical tilt is required. The operator simply turns the dial on the back of the antenna. Polarization diversity is suited to dense urban areas. This type of antenna can result in lower site costs. Fewer antennas are required to cover a given area, which simplifies mounting and allows the use of towers without platforms. This model is used by PCS systems operators in the 1,850MHz–1,990MHz band.

WWW.RFSWORLD.COM

High-gain yagi supports SCADA, RPU apps

The SAM-460 from **Samco Antennas** is a small, lightweight antenna built for the 400MHz–512MHz range. It is designed for use in a variety of situations, including SCADA and RPU applications. This antenna is hand-tuned for optimum performance in the field. It is suited for permanent applications where stealth is a factor. Features include a forward gain of 10dB, impedance of 50Ω, type N female termination and a VSWR of 1.5 to 1 or less. Polarization is vertical or horizontal.



WWW.SAMCOANTENNAS.COM

Antennas collocate multiple services

The dual-frequency, dual-polar base station antennas from **Alan Dick & Company** cover the 824MHz–894MHz and 1,850MHz–1,990MHz frequencies simultaneously. The DGX-CS65-13-0/0, DFX-CS65-13/6-0/0 and the DFX-CS65-32/18-0/0 models are useful for collocating multiple wireless services in one antenna. This allows the user to upgrade the network without adding cost. The polarization is ±45° slant, cross. The gain for these models is between 11dBi and 15dBi, with between 15.5dBi and 17dBi for the 13-0/0 model. The electrical tilt for these antennas is 0°.

WWW.ALANDICK.COM

Ad Index

Company	Page Number	Fast Fact Number	Advertiser Hotline
AC/DC Industries	89	100	281-933-0909
Air Comm	92	104	602-275-4505
Alexander Technologies	32	25	515-423-8955
The Antenna Specialists an Allen Telecom Company	22	17	440-349-8400
Astron Corp.	51	43	949-458-7277
Avtec, Inc	37	30	803-892-2181
Berkeley Varitronics	11	11	908-548-3737
Carlson Wireless	27	21	707-923-9593
ChargeGuard #1	36	29	800-458-3410
ChargeGuard #2	62	53	800-458-3410
Citel America, Inc.	84	68	305-621-0022
David Clark	68	59	508-751-5800
Commscope	33	26	828-459-5149
Comms. Specialists	BC	3	800-854-0547
Comtelco Industries	18	14	800-634-4622
Connect Systems	43	35	800-545-1349
Control Signal Corp.	76	62	800-521-2203
Cook's Communications	67	57	559-233-8818
CPI Communications	8	9	972-429-7160
Crescend Technologies	82	66	800-872-6233
Daniels Electronics	80	65	604-382-8268
Datron World Comm.	7	8	760-597-3814
Decibel Products	41	33	214-819-4281
DLC	59	51	562-404-9998
Duracomm Corp.	52	45	816-472-5544
Eartec/Porta	61	52	800-233-1113
EDX Engineering	44	36	541-345-0019
El Paso Communication	90	102	915-533-5119
Futurecom	39	31	905-860-5546
Gamber Johnson	66	56	715-344-3482
General Dynamics Decision Systems	13	12	877-449-0600
Doug Hall Electronics	54	71	614-261-8871
Hamvention	30	23	837-454-1974
ICOM America	19	15	206-450-6041
IDA Corporation	84	55	701-280-1122
I-Tech	35	28	619-458-1500
IWCE 2002	64		800-288-8606
JEI Recorder	83	67	888-677-2844
Jotto Desk	50	42	501-636-5776
JPS Communications	49	40	919-790-1011
Kenwood Communications	29	22	800-950-5005
Klein Electronics	94	107	760-781-3232
Merry Electronics	52	44	626-333-8985
Midian Electronics	55	72	520-884-7981
Midland Radio	48	39	816-241-8814
Modular Communications	9	10	818-764-1333
Narda/L3 Comm.	IBC	2	631-231-1700
National Emergency Number Association	53	46	800-322-3911
Newmar Power	50	41	714-751-0488
Norcomm Corp	69	60	800-874-8663
Omnicron Electronics	57	49	860-928-0377
Open Sky	1	4	877-OPENSKY
Paging & Wireless Service Center	54	47	561-683-0022
Polaris Industries	90	101	404-872-0722
Primus Electronics	34	27	800-435-1636
Pryme Radio	71	61	714-257-0300
Pyramid Communications	93	106	714-901-5462
Radiall/Larsen Antenna Technologies	78	64	800-268-3661
Relm Communications	15	13	800-821-2900
RF Connectors	67	58	858-549-6340
Ritron Inc	57	48	800-USA-1USA
Satel	77	63	866-738-9858
Schwaninger & Associates	25	19	202-347-8580
Shure Incorporated	21	16	847-353-3100
Sinclair Technologies	42	34	905-727-0165
Site Safe, LLC	63	54	703-558-0508
SmarTrunk Systems	58	50	866-870-9052
SoftWright	95	109	303-344-5486
Spantek Radio Bro-Comm (USA) Inc	88	109	416-335-4462
Survey Technologies	93	105	503-848-8500
Swager Communications	91	103	800-968-5601
Tekk Inc	47	38	816-746-1098
Telewave Inc	3	5	650-968-4400
Thunder Eagle	63	69	703-242-0122
Topaz3	85	70	800-821-7848
TPL Communications	40	32	323-256-3000
Trans Asia Comms & Elec	91	110	(65)745-1050
Transcrypt International	26	20	800-894-2609
Trident Micro Systems	31	24	800-798-7881
TX RX Systems	5	6	716-549-4700
Vega/Telex Signaling	6	7	402-467-5321
Vertex Standard	IFC	1	310-404-2700
Vertex Standard	64A-D	1	800-283-7839
W & W Manufacturing	45	37	800-221-0732
Zetron Inc.	23	18	425-820-6363

Product Encore

Safe batteries fit Ericsson, Motorola radios

Rechargeable replacement batteries for the Ericsson/GE LPE series, Motorola HT750/1250, GP350, P1225, Visar and XTS-3000 radios are available from **Multiplier Industries**. The batteries are intrinsically safe and non-incendive. They are approved by Factory Mutual Research in meeting the same standards as the OEM. The M191203/2 for Ericsson/GE LPE series radios is a NiCd, 7.5V battery and offers 1,200mAh capacity. The M9010 for the Motorola HT series of radios is a NiMH, 7.5V battery that offers 1,600mAh capacity. For Motorola Visar radios, the M7397 is a NiMH battery with 7.5V and 1,500mAh capacity. All batteries are designed for the exact fit to the radio and charger. Multiplier's Sure-grip surface is also available.

WWW.MULTIPLIER.COM

Crescend TECHNOLOGIES

SIMPLY BETTER

Five 100 Watt UHF Amplifiers
10.5" Total Rack Space

www.CrescendTech.com 800-USA-MADE
sales@CrescendTech.com 800-872-6233

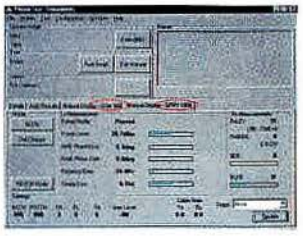
CIRCLE (66) ON FAST FACT CARD

Switch links as many as 32 sites

The ST-510 network switch from **SmarTrunk** systems provides multisite, wide-area roaming capability for any SmarTrunk II system. Now system operators can link as many as 32 sites into a single, integrated communications network. In addition to wide-area coverage, subscribers can have a host of advanced features such as voice prompts, digital voice mail and call forwarding.

WWW.SMARTRUNK.COM

Test system supports GPRS apps



The General Packet Radio Service handset from **IFR Systems** offers testing capabilities for repair centers that service and maintain GPRS mobile handsets. Designed for service operations, the 2935 radio test system offers service organizations a convenient way to upgrade their workshop's testing capability. The handset, which includes the GPRS firmware option coupled with Phonetest management software, provides the necessary signaling, test and analysis capabilities to quickly characterize transmitter and receiver performance.

WWW.IFRSYS.COM

Chargers operate as conditioners

The LAA0344 and LAA0345 conditioning battery chargers from **Relm Wireless** are compatible with all BK Radio rechargeable battery packs. Both chargers operate as standard chargers or as battery conditioners. These chargers accommodate NiCd and NiMH batteries. When operating in the conditioner mode, the charger runs the battery through a drain and charge cycle. By doing this, memory effect is reduced, resulting in a longer life for the battery.

WWW.RELM.COM

Receiver maintains LANs

Berkeley Varitronics Systems' Beetle hand-held wireless receiver is for installing and maintaining LANs. The instrument measures the coverage of direct-sequence CDMA IEEE 802.11b networks. The receiver measures and displays signal strength of all access points on all 14 DSSS channels, as well as packet-error rates and WEP encryption detection. It detects and differentiates from narrowband interferences such as microwave ovens and frequency hopping systems.

WWW.BVSYSTEMS.COM

Headset offers 'wrap around' feature

Eartec's Monarch lightweight headset is built to withstand tough conditions. The headset features a flexible backband molded with PBT, a polymer developed for manufacturing automobile bumpers. The "wrap-around" design offers a low-fatigue, comfortable fit even when worn with safety helmets. The headset includes an inline PTT assembly rated for 10,000 operations and a connector for a portable transceiver.

WWW.EARTEC.COM

Encryption scramblers support Vertex radios

Midian Electronics' plug-in encryption scramblers are for the Vertex VS 210A/400/600/800/900 portable radios. The scramblers available include the TVS-2 VX, high-security rolling code scrambler and the VPU-15 VX speech inversion scrambler. The TVS-2 scrambler offers frequency hopping and random dwell as security measures. The scramblers use proprietary Kryptic signaling, which allows for ANI, selective calling, deadbeat disable and over-the-air programming of security code when using CAD-300.

WWW.MIDIANS.COM

Radio allows one-to-one communications

Motorola's XTN series of professional two-way radios can meet today's onsite business communications needs. The lightweight XTN series allows one-to-one or group communications at the push of a button so users can track projects more efficiently and keep up with their workforce. There are no phone numbers to dial, no monthly fees or service contracts to sign. Little training is needed for team members to get fully up-to-speed.

WWW.MOTOROLA.COM

Isolator separates phone line, equipment

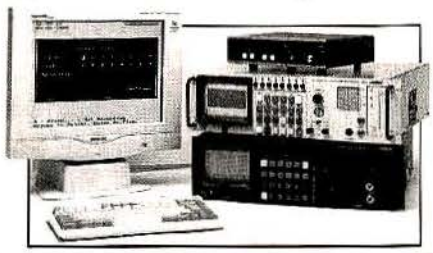
The OC-100/200 from **Hark Tower Systems** optical telephone line isolator isolates equipment from the telephone line. This is accomplished by using fiber optic technology, converting electrical signals into light, passing this light information through a 4" fiber gap and then reconstructing the light levels back into electrical signals. This allows the equipment to communicate with the telephone line without being connected to it. This isolator also regulates the current through your equipment. It provides a safe level of current flow through the equipment regardless of the current on the telephone line. There is no need to buy a current regulation device.

WWW.HARKSYSTEMS.COM

When RECORDING is CRITICAL

Voice Recording Systems Built for Today's Communication

Affordable
Reliable
Easy To Use
Dependable
Made In USA



Building Recording Systems For Over 30 Years

For A FREE Brochure or More Information on JEI Products Call
530-677-3210

COMMUNICATION RECORDING SYSTEMS JEI

3087 Alhambra Drive Cameron Park, CA www.jei-inc.com

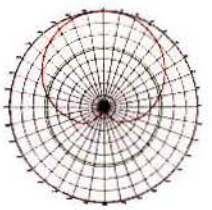
CIRCLE (67) ON FAST FACT CARD

Cable assemblies made to order

Tru-Connector's custom RF coaxial cable assemblies can include flexible and semi-rigid types ranging from 0.074" to 1.20" O.D. and can be produced in lengths as long as 150 feet, with any gender combination of plugs, jacks and panel mounts. Manufactured to specification, these assemblies can incorporate straight-through and right-angle connectors and special insulations, gaskets, jacketing, strain relief clamps and other required characteristics.

WWW.TRU-CON.COM

Antenna created for low tower load



Designed for 65° sector plans, the dBDirector ZoneMaster series of antennas from **Decibel Products** features an azimuth pattern in a slim package created for low tower load and easy zoning approval. This azimuth pattern shaping affects the level of sector-to-sector overlap, and enhanced control in this plane provides an additional level of improvement in network performance.

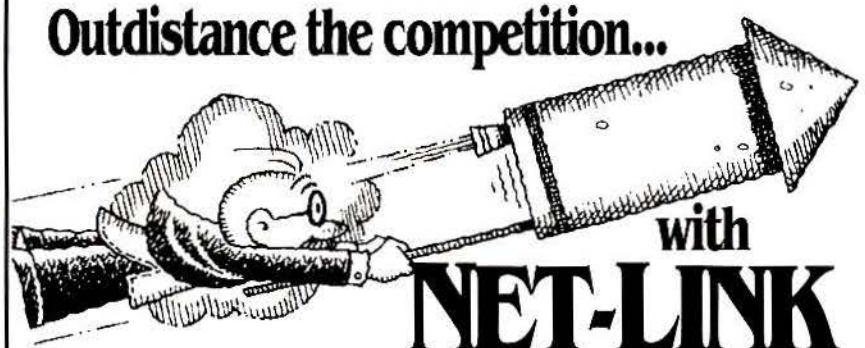
WWW.DECIBELPRODUCTS.COM

Dispatch software works with voice-over-IP

InfoLink from **Catalyst Communications Technologies** allows dispatch operators using any of Catalyst's dispatch software products to automatically open files and applications that are closely associated with the dispatch operations. Because the dispatch software runs on standard Windows-based PC platforms, thousands of applications and file-oriented tools can now be used on the same desktop monitor that presents the dispatch application. The system addition enhances the company's existing software for voice-over-IP, wide-area dispatch.

WWW.CATCOMTEC.COM

Outdistance the competition...



with NET-LINK LTR® Networking

Connect with a LTR® Networking system that will go the distance! **NET-LINK** is a software and hardware package that provides multi-user and multi-site linking between LTR® trunking systems.

With all the features your customers need and the return on investment your banker demands, **NET-LINK** eliminates the need for phone lines, microwave, or even other radio frequencies. No DTMF mics or other complicated signalling methods are needed—making **NET-LINK** nearly transparent to the end user.

See how you can shoot ahead of your competition by offering a larger service area.

Call IDA now and put yourself in the lead with NET-LINK.

IDA CORPORATION
1345 Main Ave. Fargo, ND 58103
1-800-627-4432 / 701-280-1122
218-233-1886 fax
www.idaco.com

LTR® is a registered trademark of EF Johnson.

CIRCLE (55) ON FAST FACT CARD

SURGE PROTECTION FOR:

- AC Power UL 1449 2nd Edition
- T1/ E1 lines.
- COAXIAL lines N, 7/16 DIN, TNC, SMA...

Ideal for Radio, Wireless and Cellular base stations.

Surge Arrester Gas Tubes for PCB.

www.citelprotection.com

CITEL

1-800-CITEL-4U
(305) 621-0022 • Fax (305) 621-0766
e-mail: citel4u@ix.netcom.com

CIRCLE (68) ON FAST FACT CARD
VISIT US AT IWCE, BOOTH #14142

Transceiver offers 160-plus channels

Vertex Standard's VXA-150 Pro V Air band transceiver offers a full 5W P.E.P. of transmit output power for reliability. The transceiver is rugged and water-resistant. It offers 160 channels, including all 10 NOAA weather broadcast frequencies, 50 MR channels and 100 book channels. An eight-character alphanumeric, invertible LCD on top of the unit provides an indication of either the frequency, the channel number or an alphanumeric label. The transceiver also allows the user to directly enter the frequency from the 16-button backlit keypad. This reduces the need to store frequencies into memory before operating on them.

WWW.VXSTD.COM

Telemetry antenna challenges vandalism

Maxrad has developed an antenna for wireless telemetry and meter reading applications often plagued by theft and vandalism. The MTO8903PT ultra-thin antenna provides discrete omnidirectional coverage of frequencies ranging from 896MHz–941MHz with 2.5dBi gain and a 3dB vertical beamwidth of 35°. Measuring 3" in diameter by 0.25" deep, and weighing four ounces, this ground-plane-dependent antenna can be discreetly installed on any flat metal surface including vending machines, utility meter boxes or any other telemetry location. The antenna includes six feet of RG58/U cable that can be fitted with many types of connectors. It is secured to the metal surface with a double-sided, high-bond tape for permanent indoor or outdoor use.

WWW.MAXRAD.COM

Antenna analyzer offers new configuration

Anritsu's Site Master analyzers are designed with a new configuration that makes it easier to detect cable feedline and antenna system problems before they become system failures. The models are equipped with cable-specific folders with the characteristics of the cables and all appropriate testing parameters programmed in the folders. This eliminates setup error and ensures sweep accuracy. Features include a multilingual user interface, high immunity to ambient RF levels, 517 data points that enable identification of faults, and a full range of marker and limit functions. The light, small analyzers fit in a backpack.

WWW.US.ANRITSU.COM

Software suits small police departments

The public safety dispatch software from **DataTrax 2000** is designed for small- and medium-sized police departments. It was developed using Microsoft Access 2000 and Visual Basic. A high-end server solution like Oracle or Microsoft SQL server is not required, saving the agency money.

WWW.DATATRAX2000.COM

System coordinates test equipment

Amplifier Research's Brainlink system controllers connect and coordinate multiple pieces of RF test equipment. Multiple amplifiers, antennas, signal generators, directional couplers and spectrum analyzers or receivers can now be linked in a coordinated system. This system enables a range of emissions and susceptibility tests to be conducted without manually changing cable feeds or equipment settings. Because the system automatically routes signals to and from the appropriate test equipment, a user can now conduct a series of tests from start to finish with a push of the button.

WWW.AMPLIFIERS.COM

See the Latest in AVL and LTR at IWCE Booth 11027.

Topaz3 will be displaying our ComStar AVL System, a new VHF LTR mobile, DTMF portables, repeaters and much more... Don't miss this opportunity to discuss your Total communications solution!

Topaz

IWCE Booth 11027
www.topaz3.com
800-821-7848

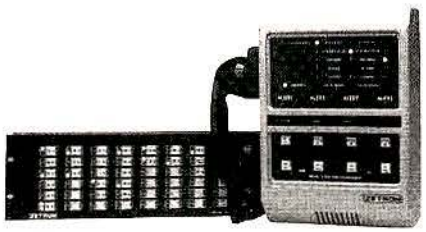
CIRCLE (70) ON FAST FACT CARD

Analyzer monitors RF performance

The VigilCom remote spectrum analyzer from **Morrow Technologies** offers a focused bandwidth design that reduces cost and size, enabling it to be installed anywhere. The frequency range of the first model, the VC70, is 60MHz to 80MHz. It is useful for monitoring the baseband RF performance of all the sites. The analyzer is a compact 8.5" × 9.85" × 1.625" and weighs less than five pounds. Simply install the analyzer at each of the sites, then operate it remotely from any location in the world via LAN, modem or the Internet.

WWW.MORROWCORP.COM

Dispatch system supports fire stations



Zetron's model 6/26 fire station alerting system comprises two main components: the Model 6 fire station transponder and the Model 26 status/control panel. The Model 6 resides in the fire station and provides an audio interface to the station's PA system, a data interface to the station printer and visual status indicators. The Model 26 resides in the dispatch center and provides buttons for dispatching, indicators to present status and a computer interface for automated dispatching. At the dispatch center, alerts are initiated with a single key press on the Model 26 or via command from a CAD host. The resultant data packet signaling the alert is transmitted to the designated fire station Model 6 in less than 1/10 of a second. On receipt, the alert is automatically acknowledged.

WWW.ZETRON.COM

Notebook operates at 800MHz

AMREL has integrated an Intel Pentium III 800MHz CPU into a rugged mobile computing system. The CPU is an optional feature available with all Rocky models including: Rocky Unlimited rugged notebook, Rocky Mobile in-vehicle computing station, Rocky Matrix all-in-one notebook and in-vehicle computing station, as well as the Rocky Patriot line of military and government computer products and the Rocky CraftPro line of telecommunications computer products.

WWW.AMREL.COM

Chalup

Changes at Sabre Communications, Sioux City, IA:

Jerry Chalup joins as national components sales manager for the Site Solutions division. **Grant Gieselman** is appointed to the position of purchasing manager. **Dan Verbeski** advances to the position of shipping manager.

Gieselman

John Sweeney departs Motorola as vice president of Asia and North America IDEN infrastructure to join Kaval Wireless Technologies, Markham, Ontario, as president of its U.S. operations.

The Cellular Telecommunications & Internet Association, Washington, appoints **Don Listwin**, president of Openwave Systems, Washington, to its board of directors.

Changes at Motorola, Schaumburg, IL:

Janilee Johnson, corporate vice president, advances to chief communications officer. **David Devonshire,** former chief financial officer of Ingersoll-Rand and Owens-Corning, joins as chief financial officer. **Edward D. Breen** head of the Networks sector, advances to president and is elected to the board of directors.

Thomas J. Starr, co-founder of the Kelso Starrs and Associates LLC consulting firm, joins Schott Applied Power, Rocklin, CA, as president.

Adel Faddah, consultant for JPS Communications, Raleigh, NC, advances to director of sales, Middle East.

Del King, E9-1-1 systems director for Greenville County, SC, for HTE, Lake Mary, FL, is promoted to vice president, public safety and justice systems with product management responsibility for more than 20 law enforcement, fire, EMS and justice products.

Tony Lane joins Midland Radio, Kansas City, MO, as senior vice president of its land mobile radio division, after spending 28 years at Motorola.

Richard A. Edwards leaves the Personal Communications Industry Association as production operations manager for frequency coordination to join Rockville, MD-based Shulman, Rogers, Gandal, Pordy & Ecker, P.A. as a part of the firm's expansion of its FCC application preparation services.

Ron Spencer, national sales manager for the receiver division at ICOM America, Bellevue, WA, advances to the position of national sales manager in the Land Mobile division.

Pack Your Suitcase

April.

23–24: British Association of Public-Safety Communications Officers, organized by Brintex, Novotel London West Convention Center, Hammersmith, London. **www.bapco.co.uk.**

24–26: International Wireless Communications Expo, co-sponsored by *Mobile Radio Technology*, Las Vegas Convention Center, Las Vegas. **www.iwceexpo.com**.

25: Simulcast Forum, Simulcast Solutions, Las Vegas Convention Center, 8 a.m., East lobby, S2, Las Vegas. **www.simulcastsolutions.com.**

28–5/1: APCO North Central Regional Conference, sponsored by the Wisconsin Chapter of APCO, Madison, WI. **www.apco2002.com**.

May

6–10: Vehicular Technology Spring Conference, sponsored by IEEE, Birmingham-Jefferson Civic Center, Birmingham, AL. **www.ieee.org**.

14: Region 13 Quarterly NPSPAC meeting, 10 a..m., South Jacksonville Police Department, South Jacksonville, IL. Contact: George Sneyd at 217-558-6444 or *sneydge@isp.state.il.us*.

15–17: 5th Annual PCIA Tower and Site Management Forum, sponsored by the Personal Communications Industry Association, Westin Diplomat Resort & Spa, Hollywood, FL. Contact: Poppie Bergere at 800-759-0300 ext. 7433 or **www.pcia.com.**

20–23: ASCENT Spring Conference, sponsored by the Association of Communications Enterprises, Paris Las Vegas Hotel, Las Vegas. **www.ascent.org.**

June

2–6: Supercomm, sponsored by TIA and USTA, Georgia World Congress Center, Atlanta. **www.supercomm2002.org.**

10–11: AMTA's 17th Annual Leadership Conference, Hyatt Regency Crystal City, Arlington, VA. **www.amtausa.org.**

16–20: NENA, sponsored by National Emergency Number Association, Indianapolis. **www.nena9-1-1.org.**

23–26: UTC Telecom, sponsored by the United Telecom Council, MGM Grand, Las Vegas. **www.utc.org.**

25–26: 16th Annual Police Security Expo, Atlantic City Convention Center, Atlantic City, NJ. **www.police-security.com.**

July

14–17: Forestry Conservation Communications Association National Conference, Radisson's Fort Magruger Hotel and Conference Center, Williamsburg, VA. **www.fcca.info.**

August

11–15: APCO Conference & Exposition, sponsored by the Association of Public-Safety Communications Officials–International, Opryland Hotel, Nashville, TN. **www.apcointl.org.**

September

17–20: PCIA GlobalXChange, sponsored by the Personal Communications Industry Association, Ernest Morial Convention Center, New Orleans. **www.pcia.com.**

October

5–9: 109th Annual IACP Conference: Law Enforcement Education Technical Exposition, Minneapolis. **www.theiacp.org.**

7–9: AMTEX 2002, Westin Fort Lauderdale hotel, Fort Lauderdale, FL. **www.amtausa.org**.

November

6–9: Private Wireless Summit, sponsored by the Industrial Telecommunications Association, Marriott Wardman Park Hotel, Washington. 703-528-5115 or **www.ita-relay.com** .

22: Radio Club of America Annual Awards Banquet and Technical Symposium, New York Athletic Club, New York. **www.radio-club-of-america.org.**

Editorial Index

Aether Systems 8
Alan Dick & Company 80
American Electric Power 65, 66, 67, 68, 69, 78
Amplifier Research 85
AMREL 86
Anritsu 85
Antenex 79
Antenna Factor 79
ARINC 8, 69
Bell South 12
Berkeley Varitronics Systems 82
Bizcom USA 74
Cadex Electronics 60, 61, 62, 63
Catalyst Communications Technologies 84
Cellemetry 30, 34
Cisco 58
ComSpace 78
CTE International 72
DataTrax 2000 85
Decibel Products 84
Dispatch Monthly 75
E. F. Johnson 75, 76
Eartec 83
Federal Express 69
Hark Tower Systems 83
HTE 86
ICOM America 86
IDA 34, 36
IFR Systems 82
IMS 75
JPS Communications 38, 40, 86
Kaval Wireless Technologies 86
Kenwood Communications 74, 75
M/A-Com Wireless Systems . 22, 75, 78
Maxrad 79, 85
Midian Electronics 83
Midland Radio 72, 86
Mobile Mark 79
Morrow Technologies 86
Motorola 6, 8,16, 18, 69, 72, 74, 75, 82, 83, 86
Multiplier Industries 82
Nextel Communications 4, 6, 65, 66, 67, 68, 69, 74, 77
Noro-Moseley Partners 78
Numerex 30
Openwave Systems 86
PCS Communications 74
Pinnacle Towers 16, 17
Radiall/Larsen Antenna Technologies 80
Radio Frequency Systems 80
RadioSoft 17
Relm Wireless 82
Sabre Communications 86
Samco Antennas 80
SBC 12
Schott Applied Power 86
Schwaninger & Associates 10
SEA 74
Securicor Wireless 72, 74
Sevin Rosen 78
Shulman, Rogers, Gandal, Pordy & Ecker 86
SmarTrunk Systems 82
SNC Manufacturing 46
Subcarrier Communications 17
Telewave 79
Transcrypt International 76
Tru-Connector 84
Uniden 74
Verizon 12
Vertex Standard 20, 75, 85
Zetron 86

MCCON

Mobile Communications Consulting
S.R. McConoughey, P.E.
Principal

13017 Chestnut Oak Drive
Gaithersburg, MD 20878 (301) 926-2837

Computer Software **95**
Employment **89**
Equipment For Sale **88**
Equipment Wanted **88**
Professional Services **88**
Rentals and Repairs **94**
Services **88**
Tower Space **91**

Dawn Rhoden
Classified
Advertising Manager

800-347-9375

GE PORTABLE SERVICE
• FAST TURN
• WARRANTY
• $48.00 hr./2 hr. MAX
• PARTS GE LIST
• RETURN UPS PAID
Smith Communications Service
2121 W. Parrish Ave., Owensboro, KY 42301
270-683-0936

PORTA-TECH PORTABLE TECHNICAL SERVICE, INC
493 Crowell Lane • Lynchburg, VA 24502
FACTORY TRAINED TECHNICIANS FOR QUALITY SERVICE
GE Portable Radio Service Depot
Factory Approved Nationwide
• Current Product Lines
• Voice Guard Certified
• Public Service Trunking
• Surface Mount Technology
ERICSSON
(434) 239-3049

SCHWANINGER & ASSOCIATES
Attorneys at Law
Robert H. Schwaninger, Jr.
1331 H Street N.W. Suite 500
Washington, DC 20005
Ph- 202-347-8580
Fax 202-347-8607

FREDERICK G. GRIFFIN, P.C.
2938 Waterlick Road
Lynchburg, VA 24502
(434) 237-2044
NATIONWIDE COMMUNICATIONS CONSULTING
Mobile Radio, Microwave, E9-1-1,
CAD, Paging, LAN,
Dispatch Communications Centers
Multi Site Propagation Analysis

TROTT
COMMUNICATIONS GROUP
RAYMOND C. TROTT, P.E.
Chairman
1425 Greenway Drive, Suite 350
Irving, Texas 75038
972/580-1911 • Fax: 972/580-0641

We need
AGENTS & RESELLERS
to sell
INTERNET &
VPN SERVICES
in the U.S. & Canada
North American DataCom
662.424.5030

Gene A. Buzzi
Senior Vice President
Corporate Development
tel (850) 224-4451
ext. 15
fax (850) 224-3059
e-mail gbuzzi@rcc.com
RCC Consultants, Inc.
930 Thomasville Road, Suite 200, Tallahassee, FL 32303

Equipment Wanted

EQUIPMENT WANTED
USED 800/900 MHz
MOTOROLA / LTR REPEATERS /
COMBINERS / RADIOS
CONTACT PH: 702-252-8525
or e-mail: rfdinc@aol.com

Services

The only address you need to address
FCC RF Radiation and OSHA regulations.
www.rfcomply.com
RSI
Radiofrequency Safety International Corp.
Ph: 888-830-5648
"Safety is our middle name"

Equipment for Sale

PRE-OWNED 2-WAY RADIO EQUIPMENT
BRO-COMM (USA) Inc
BROKERS - BUYS - SELLS
Pre-Owned Radio Communications Systems, Infrastructure,
Mobiles, Base Stations, Handhelds & Test Equipment
Please e-mail or Fax us a list of any of the above items
you may have surplus.....We buy continent wide
Bro-Comm (USA) Inc
Sarasota, Florida
Toll Free Tel 866-520-5700
Fax 941-924-7422
e-mail reg@bro-comm-usa.com • Web Page www.bro-com-usa.com
Visit us at IWCE 2002, Las Vegas, April 24-26
CIRCLE (109) ON FAST FACT CARD

CMC ENTERPRISES 2-WAY, MICROWAVE & TELECOM EQPT.

Quantity	Equipment List	Price
ALL TOWERS ARE ON THE GROUND READY FOR P/UP•OTHER SITES AVAIL.		
01	RHON USED 200' SSV BOTTOM SECTION 15 NH	$9000 OBO★
50	MOTOROLA SYNTOR XX (30-50 MHZ) SYS-90	$200 OBO★
10	MOTOROLA MICOR 800 TRUCKING 75W SOLID STATE PA REPEATERS	$900EA★
15	MOTOROLA SYNTORX 9000 UHF 110W VCC	$350 OBO★
20	MOTOROLA MARATRAC LO BAND 110W 42-50 MHZ	$250.OBO★
03	GE MASTR II REPEATERS HI BAND 110W	$1200.OBO★
50	MOTOROLA STARPLUS CHANNEL MODEMS MLN 6625	$225 OBO★
50	MOTOROLA STARPLUS CHANNEL MODEMS (TX) QRN 4535A	$125 OBO★
50	MOTOROLA STARPLUS CHANNEL MODEMS (RX) QRN 4537A	$125 OBO★
60	MOROROLA SIMULCAST REMOTE DELAY MODULES TRN9964A	$175 OBO★
15	MOTOROLA SIMULCAST CONTROLLER INTERFACE MODULES	**CALL**★
	LOTS OF MOTOROLA "GRANGER, LENKURT" MULTIPLEX	**CALL**★
25	GE DELTA UHF SX 110W	$225 OBO★
15	GRANGER LOW BAND 110W	$275 OBO★
15	GE RANGER UHF 110W	$275 OBO★
01	ROHN SSV TOWER 130' (BOTTOM SECTION #10N)	$4000 OBO★
01	ROHN SSV TOWER 140' (BOTTOM SECTION #10N)	4400 OBO★
01	ROHN SSV TOWER 160' (BOTTOM SECTION #12NH)	$6500 OBO★
01	GRASIS M 46 300' TOWER	$6500 OBO
01	ADVANCE INDUSTRIES 48" FACE 330' TOWER	$5500 OBO
01	ADVANCE INDUSTRIES 48" FACE 360' TOWER	$6000 OBO

★New Listing★ Call Charles at 336-769-2885
For more equipment, visit our website at www.cmcent.com

Comark
DISTRIBUTING INC.
1-800-777-2708
"We've got what you need"
Antennas - Coax
Connectors - Batteries
Mounting Hardware
and More!
Gamber Johnson - Maxrad
Multiplier - Astron - JSC
RF Industries - A/S!
MAXRAD
EFJ
ASTRON

Equipment for Sale

See us at IWCE booth #10107

Delay Timer

"ON WHEN IGNITION IS OFF"

- Battery & Equipment Protection Device
- Low/High Voltage load shut down
- Allows retrieval of data for MDT, GPS, AVL
- 30 AMP 12 Volt DC
- Low voltage sensor (10.5V) - Over voltage protection (17V)
- One year warranty.

WIG-WAG
HEADLIGHT FLASHER
100% SOLID STATE

- Power: 12 volts, negative ground system
- Up to 4 different patterns
- Flash rate: Nominal 1.9 per second on wigwag pattern
- Lamp Wattage Capacity: 180 watts
- Current Output: 15 Amps
- Size: L 4" x W 2" 1/8 x H 1/2" ~ Wt 3 1/2 oz.
- For all US made vehicles

AC/DC INDUSTRIES
P. O. BOX 710548, HOUSTON, TEXAS 77271
Tel: (281) 933-0909 • Fax: (281) 933-1001
Toll Free: 800-888-0909
Web-Site: www.acdcind.com
E-mail: sales@acdcind.com

CIRCLE (100) ON FAST FACT CARD

UNUSED SURPLUS SITE EQUIPMENT

JOHN R DANIELSON•sigintdf.com
OFFICE 515-961-6152
MOBILE 515-240-6552

REC, MULTICOUPLERS, TTA, DUPLEXERS, FILTERS, COMBINERS REC AMPS. POWER DIVIDERS UHF, 800,900, JSMR 1500 MHZ
MAJOR MANUFACTURES

COMPLETE CHANNEL ELEMENTS
YOUR FREQUENCY
LIFETIME GUARANTEE
Most Elements $20.00 with Trade

Crystals
We Buy Used Elements

NKX
1814 Hancock St.
Gretna, LA 70053
504-361-5525 (in LA) • 800-237-6519
FAX 504-361-5526

WASHINGTON STATE DEPARTMENT OF
Natural Resources
Doug Sutherland · Commissioner of Public Lands

RADIO COMMUNICATIONS SYSTEMS MANAGER
JOB OPPORTUNITY

SALARY RANGE: $3,916 - $5,531/mo.
LOCATION: Olympia Washington
CLOSING DATE: 5:00 p.m. on May 8, 2002

The Washington State Department of Natural Resources (DNR) is anticipating a vacancy for Radio Communication Systems Manager. DNR manages over five million acres of land and depends on its two-way radio system to carry out the agency's mission. The radio system is used for wildfire initial dispatch, fire command, public evacuation, firefighter safety and day-to-day resource management operations. This position manages the agency's two-way radio communication program (Project 25). For more information about this position, visit www.wa.gov/dnr/jobs or contact Toni at 360-902-1602.

RF Field TechnicianWanted

Applicant will have a high degree of integrity, experience in RF systems design, construction and maintenance. Associates degree in electronics and FCC, PCIA, amateur radio licensing / certification highly desirable. Some travel required out of Hollywood, FL office.

Advantage Communications, Inc.
Contact: Mark Lavallee
954-961-2642

WIRELESS COMMUNICATIONS TECHNICIAN

Field technician–Must be experienced in systems: base stations consoles, microwave and data. PCIA or FCC certification preferred. Resume to:

Metropolitan Communications, Inc.
309 Commerce Drive, Exton, PA 19341
E-Mail: mcs@chesco.com
Fax (610) 524-9970

WWW.MRTMAG.COM

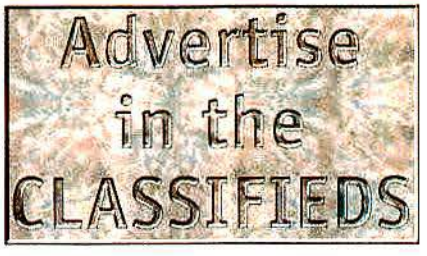
Equipment for Sale

Test Equipment - We Buy & Sell

Equipment Includes minimum: 90 Day Warr. & NIST Calibration

HP8920A/102,03,04,05 ~ $6900	HP8920A/01,03,04,05 ~ $4900.
HP8921A ~ $7500.	HP8921A/600-CDMA ~ $8000.
HP892 IA/500-TDMA ~ $8500.	HP83204A (IS136-TDMA) ~ $2500.
HP8920~/102/4 ~ $7,500.	HP8920B/01,04,06,13,14 ~ $5900
HP8920B/01,04,06,13,14,50,102 ~ $7500	HP83206A(IS136-TDMA) ~ $900.
HP8920B/01,04,06,13,14,51,102,800	(IS136 - TDMA) ~ $8500
HP83236B(PCS) ~ $3500.	HP8922S GSM ~ $5500.
HP8922P(GSM/PCS) ~ $9,900.	HP8922M ~ $6900.
HP8924C (CDMA) ~ $13,900.	HP8924E(CDMA) ~ $ 10,900.
HP8594E/4/41/50 ~ $6900,	IFR COMI20A ~ $6500.
IFR1600S ~ $590D.	IFR 1600CSA ~ $6500;IFR500A ~ $3900
Motorola R2600C ~ $6900.	Motorola R2600B/HS-$6500.
Motorola R2600B/NT ~ $5900.	Motorola R2009B ~ $4500.
Wavetek 3600D-CDMA ~ $ 10,500.	Wavetek 3600D-IS 136TDMA ~ $10,500.
1000Mhz Sig.Generators:	HP8657A ~ $2500.
Fluke 6061A ~ $1600.	Marconi 2022E ~ $1800.
2000 Mhz Sig. Generators	Fluke 6082A - 100Khz-2.1 Ghz-$5900
HP5334~ (1.3Ghz counter) ~ $375.	HP8903B Audio Analyzer-$ 1900.
TIMS Sets: HP4935A ~ $950 ; HP4934A ~ $1350.	
HP8902A Measurement Receiver (mint)-$8,900 ; HP8901 B ~ $2400.	
New Anritsu Sitemasters on Sale! ~ CALL!	

Amtronix Instruments, Inc
www.amtronix.com
Ph: 716-763-9104; Fax: 716-763-0371



BUY •• SELL •• Trade

COME SEE US AT THE
"DAYTON HAMVENTION"
IN DAYTON, OHIO ON
MAY 17, 18, AND 19

WE WILL BE IN THE NEW
COMMERCIAL TENT AREA

SPACES 1202 AND 1203

We are always buying and trading for good used equipment and accessories

WOLFE COMMUNICATIONS
1113 Central Avenue
Billings, MT 59102
Phone: 406-252-9220
Fax: 406-252-9617
E-mail: cwwolfecom@aol.com

www.polarisradio.com

Model #	The Motorola® Radio It Programs	Price
1	HT50 and the Radius P100 Models.	$69.95
2	HT600, MT800, MT1000, P200, P500, MTX800, MTX810, MTX820, MTX900	$69.95
3	MARATRAC, SM10/SM50, GM300	
	RADIUS - M100/M206/M208/M214/M216/M400/M860, MAXTRAC - 50/100/300/820/840	$59.95
3B	MCS-2000	$49.95
4	STX, STX Gemini, STX 821 trunked portables	$49.95
5	SABER and System SABER	$99.95
6A	SPECTRA Low and Medium Power Units	$59.95
6B	SPECTRA 100 Watt and High Power Units	$59.95
7	SYNTOR 9000 and 9000E Radio Line	$169.95
9	R100 Repeater	$44.00
10	MCX1000	$35.95
11	Cloning Cable for the Motorola® HT600 / MT1000	$59.95
12A	GP300, GP350, and P110 Models	$134.95
13	MSF5000 Digital Unit with 3 Digit Display in Controller Tray	$35.95
14	HT1000, MT2000, MTX 8[illegible]000, MTX 9000 and JEDI Series	$125.95
15	Visar Unit	$99.95
16	Cloning Cable for the Motorola® JEDI Series	$119.95
17	ASTRO SABER and SABER SI	$99.95
18	SP50	$89.95
19	M1225	$39.95
20	P1225	$99.95
21	HT750, HT1250	$99.95

Competitively Priced!

Order by 4pm EST & Your Order is Shipped Same Day!

Radio Programming Cables
Tech info: 404.872.0722

✓ Professional Users Guide with Detailed Photos Included with All Products.
✓ High Quality, Reliability and Performance at a Low Price - CALL TODAY!!!

Compatible Motorola Radio Programmers

PA-I Programming Adaptor...$119.95
- Compatible with "RIB" Unit
- Rugged Steel Case
- Power LED

PA-II Programming Adaptor...$139.95
- Contains Rechargeable NI-CAD Batteries
- Perfect for Field Use and Portable Laptop/Notebook Computers
- Status LEDs: Power On & Data Transfer
- Power Switch
- Power/Charger Included
- Runs for 8 Continuous Hours from One Full Charge

PA-III Pocket Programmer...$169.95
- Micro-Size Design for Convenient Portability & Field Use-Laptops
- Uses Surface Mount Technology
- Rechargeable Battery - Works Hours on One Full Charge

NOTE: Hardware Only, Software sold by Motorola® and other products are Trademarks of Motorola®, Inc.

Polaris Industries, Inc.
470 Armour Dr. NE • Atlanta GA 30324
FAX 404.872.1038

No substitutions, swap-outs or adjustments to prior sales.

1-800-752-3571

CIRCLE (101) ON FAST FACT CARD

WE BUY AND SELL USED MOTOROLA, GE AND ERICSSON FM TWO-WAY RADIOS

SCHAEFER RADIO CO.
130 West Fayette St.,
P.O. Box 395
Denver, IA
50622
PHONE:
(319)
984-6115
FAX:
(319)
984-6220

QTY	
6	ea. PURC 5000 BASES, 900 MHZ, C85JLB1101A
2	ea. MICOR PURC BASES, 900 MHz, C75JZB1101A
3	ea. MICOR RPTRS. 800 MHz C55RCB5103AT
1	ea. TXRX 5 CHANNEL COMBINER, 800 MHz
2	ea. GTX 800 MHz, LTR M11UGD6CU1AN
10	ea. MAXTRAC, 800 MHz, D3SMQA5GB5AK
30	ea. RADIUS P200,490 MHz, H44RFU7120BN
1	ea. MSF 5000 RPTR. 460 MHz, C74CXB7106BT
14	ea. GR1225 RPTRS. 460 MHz, H5157A
7	ea. MICOR RPTRS, 460 MHz, C64RCB3105
2	ea. DESKTRAC BASES, 460 MHz, L545UM70D0B
14	ea. SINCLAIR DUPLEXERS, 460 MHz, C3034-2F
90	ea. SYNTOR X 9000, 460 MHz, T34KEJ7J04AK
90	ea. SYNTOR X 9000, ACCESSORY GROUPS
12	ea. MAXTRAC, 460 MHz, D44MJA7JA5AK
12	ea. RADIUS M120, 460 MHz, M44GMC20A3AA
99	ea. RADIUS GM300, 460 MHz, M34GMC29C3AA
6	ea. RADIUS M100, 460 MHz, D34LRA73A5BK
7	ea. MAXTRAC, 460 MHz, D34MJA73A5CK
2	ea. HT1000, 460 MHz, H01RDC9AA1DN
2	ea. MT1000, 460 MHz, H44GCU7109BN
32	ea. HT600, 460 MHz, H34SVU7160BN
12	ea. GP300, 460 MHz, P94YPC20A2AA
1	ea. MSR2000 BASE, 155 MHz, C73KSB1146B
1	ea. MICOR BASE, 155 MHz, C73RTB1106E
99	ea. SYNTOR X 9000,155 MHz, T73KEJ7J04AK
28	ea. MAXTRAC, 155 MHz, T73XTA7DA3AK
10	ea. MITREK, 155 MHz, T83JJA3000
5	ea. MAXTRAC, 155 MHz, D43MJA7JA5AK
43	ea. MAXTRAC, 153 MHz, D43MJA77A3CK
24	ea. MARATRAC, 48 MHz, T81XTA7DA3AK
99	ea. MITREK, 48 MHz, T81JJA4000
2	ea. HT1000, 155 MHz, H01KDC9AA1DN
10	ea. MICOR BASE, 37 MHz, C71RTB1406
22	ea. MARATRAC, 37MHz, T81XTA7A5BK
99	ea. MITREK 35 MHz, T81JJA4900DK
5	ea. DC DESK SETS, T1375
22	ea. LOCAL DESK SETS, T1370

WANTED: GP300 Portables, VHF/UHF SPECTRA Mobiles and UHF SYNTOR Mobiles

BUYING ERICSSON - GE EQUIPMENT

BUYING ERICSSON-GE EQUIPMENT

LPE-200 800 EDAC From	650
PCS/MPA/LPE/KPC rapid multi-Chgr	295
MPA/MPID std. desk charger	25
Monogram port. 36-42 new	100
11,000 Items new GE parts	Call
VHF/UHF/800 Voting aux rec.	250
S825 Scan head w/warranty	200
S990 128 ch head w/warranty	125
S950 128 ch head w/warranty	75
S550 Scan control head mint	195
Phoenix-SX 16Ch VHF W/acc.	150
MLSH040/041- VHF MLS w/acc.	150
MLS 440-470 w/acc.	250
MLS 30-42/42-50 w/acc.	250
MLS-II 403-430 or 150-174 new radios less acc. & control pnl	50
MVS VHF & UHF w/acc.	250
KPC300 Ericsson VHF & UHF Port.	225
PCS UHF 2 CH Tech. specials	40
Rangr 150-174 110w less acc.	325
Rangr 30-42/35-50 100w less acc	325
Rangr 440-470 100w less acc.	325
Delta-S 450-470 less acc. 100w	250
Delta-SX 150-174 less acc. 100w	250
MASTR II 150-174 110w less ace.	125
MASTR II 42-50 110W	125

NEW LONDON TECHNOLOGY
752 Alum Springs Road • Forest, VA 24551
Tel: 434-525-0068 • Fax: 434-525-0078
www.newlondontech.com

TWO WAY RADIOS & ACCESSORIES
BASE ANTENNAS
MOBILE ANTENNAS
PORTABLE & GPS ANTENNAS
COAX CABLE & CONNECTORS
RECHARGABLE BATTERIES
RF AMPLIFIERS
REPEATER & INTERFACES
ENCODERS & DECODERS
LIGHTNING PROTECTORS
DUPLEXERS
TOWER SECTIONS
POWER SUPPLIES
PROGRAMMING
SOLAR MODULES
DC AC INVERTERS
DC DC CONVERTERS
RF TEST EQUIPMENT

Immediate Delivery, Warranty & Service

High Quality at Affordable Prices..!!

EPCOM

MIAMI, FL.
[illegible]
MIAMI, FL. 33166 U.S.A.
[illegible]

Ask for your free Catalog

EL PASO, TX
[illegible]
EL PASO, TX 79901 U.S.A.
[illegible]

CIRCLE (102) ON FAST FACT CARD

• BUY • SELL • TRADE •

• BOARDS • STRIPS • ACCESSORIES • ELEMENTS • REEDS •

PCI — PEKAAR COMMUNICATION INC.

$ Specials of the month $ *Steve's back, formerly of Gregory Electronics Corp.*

GE RANGR 36-50 range 40W w/accessories	$135
GE MASTER II Base Cards, DC control, RX control, Remote audio, TX control, PSLM, STE, alarm tone	$25
GE ORION mobiles 42- 50 range 60 watt with accessories	$400
GE EXECT II 40W table top base, low band	$65
GE MDS mobiles high band with access. Model TLH22	$80
GE MLS mobiles high band, with mic & bracket	$165
GE MLS UHF mobiles with mic. and bracket	$155
GE S550 Scan control head	$65
GE PHOENIX Mobile beige	$98
GE PCS Portable 470-490 range w/battery & antenna	$99
MOTOROLA Mitrek 39-50 range 60W w/accessories	$78
REGENCY Mobile model BTH201 high band	$20
MOTOROLA Micor 150-170 range, 100W range less accessories	$50

Catalog Available...If you can't find it, try us! Call (973) 772-0704 or fax (973) 340-1902

• REEDS • ELEMENTS • ACCESSORIES • STRIPS • BOARDS •

• BUY • SELL • TRADE •

Need more information on a product or company? Use the Fast Fact Card

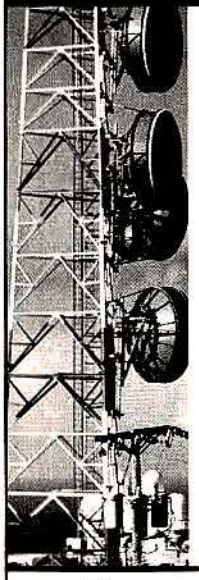
EQUIPMENT FOR SALE

Used 800 mhz
Master II / Repeaters/
Combiners/Radios

Phone 1-800-589-6158

Tower Space

TOWER



- *Fabrication*
- *Design*
- *Engineering*
- *Installation*
- *Service*
- *Maintenance*

Swager is your worldwide turnkey tower company.

Phone
1-800-968-5601
or Fax
1-800-882-3414

SWAGER Communications, Inc.

P.O. Box 656
501 East Swager Drive
Fremont, IN 46737 USA
Phone 1-800-968-5601 • 260-495-2515
Fax 1-800-882-3414 • 260-495-4205
E-mail: sales@swager.com
Internet: www.swager.com

CIRCLE (103) ON FAST FACT CARD

SPRING SALE

OVERSTOCKED! Must sell NOW -- Make an Offer.
See our website for 100s more items. • barnettelec.com • email bobb@flash.net
Min order $200 + shipping • VISA/MC, NO COD'S

1	DESKTRAC BASE 100W 42-50 L/NEW TONE	OFFER
30	155 WATT 800 MHZ PA DBP155CM2A-G WIDE BAND SOLD STATE	SALE $500
15	TPL250 WATT PA 8-286 HMS W/PS	SALE $350
200	MICOR C55RCB5103 AT 800 MHZ REPEATERS 35,75 & 150 WATT	SALE $250
40	SMARTNET TRUNKED SYSTEM CONTROLLER T5076 & others	SALE $1000
50	MICOR C73RTB1106E VHF 100W BASE/REPT	SALE $500
50	SYNTOR X CONSOLET & BASE 800T	SALE $150
6	MSF 5000 UHF C74CLB 110W REPT	SALE $1995
30	GE 900 MHZ DIGITAL PAGING OR CONV REPT 60 WATT	SALE $500
50	MICOR VHF-UHF, 30-50 MHZ BASE/REPT 100-375W	
25	GE MASTR II BASE/REPT 30-50 MHZ, VHF, UHF	
40	CELWAVE SJD 880-5T, W/5CH MULTICOUPLER	SALE $750
50	SPECTRATAC RECEIVER, VOTER NEW	$395
30	STX 800 TYPE I & II, PORTABLES	SALE $200
200	EXPO VHF PORTABLES W/CHARGER	SALE $50
50	SABER-I UHF PORTABLE W/ CONVERTACOM	SALE $200
4	MARATRAC 36-42 MHz 60W 2CH W/ACC	NEW $295
200	MICOR VHF 100W 12CH W/ACC	4 / $200
100	SYNTOR X VHF 100W 32CH W/ACC	SALE $100
100	DELTA S VHF 100W 16/32 CH W/ACC	SALE $50
200	MASTR E VHF 12 CH 100W W/ACC	SALE $50
4	MLSL-260 60W 2 CH 42-50 MHz	$295
50	SYNTOR X 9000 CABLES NEW HKN4221A	$100ea 10/$750
6	DIGITAL REMOTES L1667-1668, DGT-9000	$350
50	MITREK 60-100W 30-39 MHz / VHF150	FROM $100
10	MIDLAND 70-050 42-50 MHz 60 W	$100
2	MIDLAND SII-70-0500C 42-50MHz 100W D/M NEW	$495
1	MIDLAND XTR 70-1442 XTR 40 WATT VHF R/M NEW	$395
2	MIDLAND SII 70-2950 VHF 80 W W/PAC REPTR	$595
1	MIDLAND XTR 70-1632B UHF 40W R/M NEW	$395
50	SYNTOR X 9000 800 TRUNKED TYPE I / II & CONV	SALE $150ea
50	SYNTOR X 9000 UHF 32 CH W/ACC	SALE 4 / $1000
400	MOT PAC-RT REPT UHF/VHF	SALE $100
30	SYNTOR X 800 CONVENTIONAL 35W	SALE $50
10	SPECTRA 900 B7 15W	SALE $100
20	SYNTOR X 9000 CONVENTIOANL 35W 800 MHz	SALE $100
25	CENTRACOM II SYSTEMS, CARDS, PARTS & CABINETS	50%OFF
100	T-1600 TONE 4 CH REMOTES	SALE $100
100	T-1383 TONE2 CH TEL REMOTES	SALE $50

BARNETT ELECTRONICS INC
330 HWY, 236 Lonoke, AR 72086 • Phone: 800-423-3858
FAX: 501-676-2475 • Info: 501-676-5506 • Hrs 8-5 M-F CDT

TRANS-ASIA COMMUNICATIONS & ELECTRONICS PTE. LTD

50 Macpherson Road #04-01 Three Rifles Building, Singapore 348471 • TEL: (65) 745-1050
FAX: (65) 745-3831 • E-MAIL: gillmon@mbox4.singnet.com.sg • WEBSITE: www.trans-asia.com.sg

New Equipment Available

Item	Qty	Description	USD Unit Cost
1.	02	Pro 5550PP 800 mhz N/KPD portable unit, **LAH25UCC6GB3AN**	$250.00
2.	02	Mobile **D45MJA77A4AK** M300, 800 CONV, 35W 806-970 mhz	240.00
3.	01	**M11UGD6CBIAN** GTX Mobile 800 mhz, Privacy Plus - 15W	220.00
4.	01	M300 VHF 45W **D43MJA77A3CK** 146-174 mhz, 6 channels	240.00

Optional Equipment Available

We have the following Motorola Advisor Paging software and hardware also available (New in the box):

1.	01	Advisor Gold pager program software & manual **6881023B20**	US$90.00
2.	01	Program interface/hardware **0102720J92**	140.00
3.	01	Programming kit **NYN1435**	150.00
4.	01	Universal hardware kit **NLN3548**	380.00
5	01	Motorola Advisor manual	120.00
6.	29	Motorola Saber **I VHF**, (used), 12Ch, 136-174 mhz (h43), 2.5W. Intrinsically Safe, WP model in working order (radio only working) needs antenna and battery.	$180.00 ea

Special Offer on this Motorola (new) MSF Limited Base Station Repeater complete with all accessories operating on the 150-155 mhz frequency range. For a total price of **US$3,500.00** you can purchase this equipment valued at $9,650.00 - a savings of $6,150.00

Shipping charges are included in all equipment you purchase

01 Model No :MSF Limited Motorola • Part No: C63RLB7106T
Equip. Type : 75 watts conventional repeater unit • Freq. Range : 132-174 mhz
Basic package shall include the following:
01 X Indoor equipment cabinet • 01 X 2-wire audio • 01 X C257, power supply, 180-280 VAC/50 hz
01 X C149, Metering panel • 01 X C432, Service manual • 01 X TLN5935A, Extender card
02 X DB-228, Exposed diplole antenna assembly • 01 X 100 ft, 1/2" LDF TX line with connectors

7. 01 Model No: DB4044WC • Equip. Type: Duplexer unit Freq. Range: 132-174 mhz

CIRCLE (110) ON FAST FACT CARD

WHY PAY MORE

Air Comm: First in Quality – Price – Selection – Satisfaction

SAVE THIS AD

NEW* (old stock)

"Key Note"

Tone&Voice (QCII)

152-159 MHz or 164-169 MHz

w/VIB **$125**

w/o VIB **$115**

*w/o warranty

Reconditioned

"Maxtrac" "M100"

40W 2 CH

450-470 MHz

$250

150-174 MHz: CALL

"Maratrac"

N.O.S and Reconditioned

30-36 MHz

42-50 MHz

100 watt

16 CH $450

99 CH $500

*N.O.S -- add $100 (99F)

NEW* (old stock)

"HT1000"

136-178 MHz

5W 2/16CH

$400 /425

or

4W 2/16CH

$425/450

*N.O.S w/ accessories

"Mastr II"

450-470 MHz

(also 150-162MHz)

AUXILARY RECEIVER w/GC

Complete/drawer

$150

Reconditioned

"Syntor X"

30-50 MHz

100W 16CH

w/accessories

$400

NEW*

"GP350"

438-470 MHz

4W 2/6 CH

Narrow Band

(12.5 KHz)

w/accy

$300/350

*DISCONTINUED (N.O.S.)

RECENT ARRIVALS

MOTOROLA ACCESSORY ITEMS - NEW

MODEL NO.	DESCRIPTION	UNIT PRICE
NTN1174	HT1000 10-HR CHRGR	$20
RPX4747	HT1000 INTELI-CHRGR (NIMH)	$50
NTN5487	SABER SVA ONLY	$200
NTN8375	VISAR 2-UNIT CHRGR	$50
NLN4369	MX DC VEHICLE CHRGR	$75
HTN9014	SP50 10-HR CHRGR	$20
HLN 9090	SP50 6-UNIT CHRGR CONVERSION KIT	$140
NTN5613	MT1000 ENHANCED VEHICLE CHRGR ONLY	$125
AAHMN9052	HT750 REMOTE SPKR MIC (FM)	$40
HLN3085	GP350 DTMF RETROFIT KIT	$50
RKN4042	VISAR PROG CABLE (30-80371E46)	$95
NTN4741	SABER I BELT CLIP	$5
HAD9728	VHF TUNEABLE ANT	$5
HHN9027	SP50 10F HSNG KIT	$20
L1474	DC REMOTE HANDSET	$125
L1547	DC REM ADAPTER W/O XFMR	$100
NYN8346	MINITOR III AC DESK CHARGER	$22
NYN8348	MINITOR III AMPL SPKR CHRGR W/O FMXR	$40
NRN4987	MINITOR II XFMR FOR AMPL CHRGR	$10
NON-MUT	PAGER PROG BOX (P.I.B.)	$90
NYN8355	MINITOR III PAGER INSERT	$75
HMM3220	M SERIES MIC	$20
HMN1037	M SERIES DTMF MIC	$75
	SHURE 885TT DTMF MIC W/O CORD	$40
HLN5189	MAXTRAC/GM SERIES NON-LOCKING MNTG BRKT	$5
HLN9404	M208 MNTG BRKT	$10
HSN4020	MARATRAC EXT'L SPKR	$25
HSN4032	MCS EXT'L SPKR	$20
RAF4003ARM	900MHz GAIN ANT KIT	$15
RAB SERIES	30-36, 36-42, 42-50 MHZ ANT KIT	$25
RTL 4115	R2400 SERIES EQUIPMENT CASE (ONLY)	$100

OTHER ACCESSORY ITEMS

DESCRIPTION	UNIT PRICE
PD526 VHF 5.25db STATIONMASTER ANT	$350
DB201H VHF DECIBEL UNITY BASE ANT	$100
DB6360C DECIBEL UHF UNITY (F-GLASS) ANT	$150
K220 ASP MAGNET MNT KIT W/PL259	$10
MOT "SPECTRA-TAC" COMPARATUR W/O SQM	$200
MOT SQM FOR COMPARATUR	$75
MOT "MICOR" CABINETS, 30", 42", 72"	CALL
ASTRON VARIOUS AC/DC POWER SUPPLIES	CALL
ASP 900 MHZ 15 PORT RCVR MULTI-CPLR	$100
SINCLAIR 900 MHZ 4 PORT RCVR MULTI-CPLR	$50
E/GE "MONOGRAM" PORT SPKR-MIC (KRY101-1611)	$15

Reconditioned

"GP300"

438-470MHz

4W 2CH

Narrow Band

(12.5 KHz)

Radio/Ant only

$225

Reconditioned

"MT 2000"

VHF/UHF

4/5 WATT 48CH

~ CALL ~

MOTOROLA

The Low Cost Alternative!

TS11

The "TS10" Replacement

1 Watt 1 Ch (16F choices)

1watt "PL" included

UHF: $146

VHF: $132

IWCE Special Offer Expires 5-17-02

AIR COMM

TWO-WAY RADIO SALES

www.air-comm.com

CALL/FAX FOR OTHER RADIOS & ACCESSORIES!

602-275-4505 • FAX:602-275-4555 • email: sales@air-comm.com

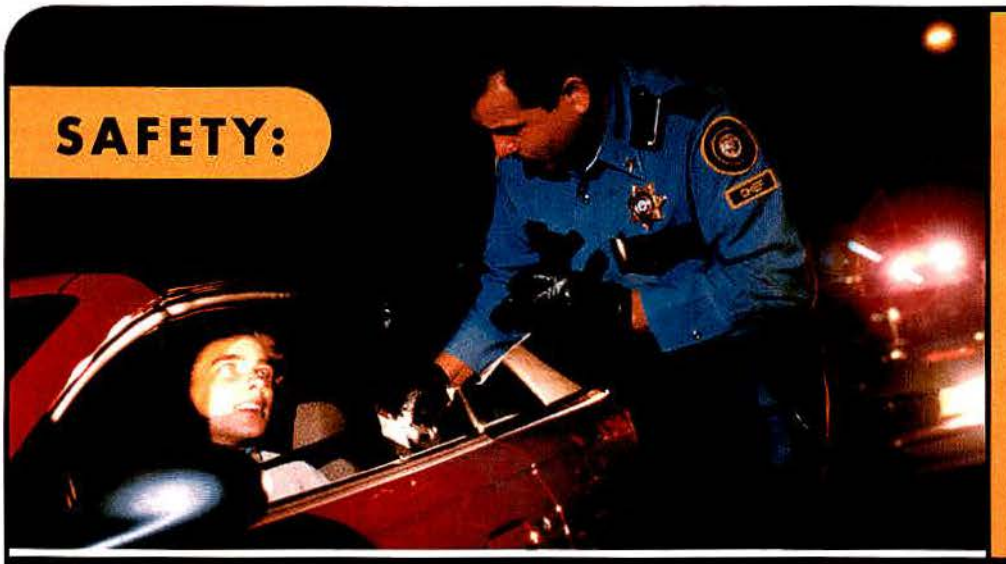
WE STOCK "PL", Minitor II Filters, Paging Reeds,TCXOS

4614 East McDowell Road

Phoenix, AZ 85008

SAVE THIS AD

CIRCLE (104) ON FAST FACT CARD



THE EARLY ELIMINATION OF DANGEROUS POSSIBILITIES

In a world of risk, all the training and equipment in the world won't make up for a break in mobile communications.

STI provides the system you need to automate radio signal measurements and analyze the results with contour plots and measurement summaries. You get concise reports identifying weak spots in signal coverage, so you can address problem areas before unreliability becomes a liability.

The key to safety is planning. Make sure your team has the critical communication coverage it needs to succeed.

STI Survey Technologies Incorporated

"Geographic Signal Coverage At Your Fingertips."

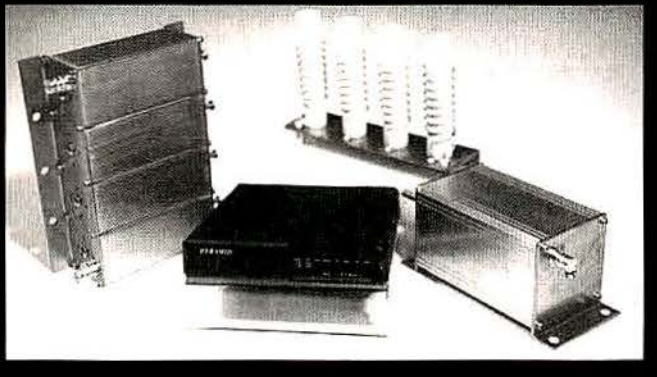
877-848-8500 toll-free
local: 503-848-8500 fax: 503-848-8534
www.surveytech.com
marketing@surveytech.com
8085 S.W. Nimbus Avenue • Beaverton, OR 97008

CIRCLE (105) ON FAST FACT CARD

And They said it couldn't be done.....

VHF Inband vehicular repeating now available.

Dealers - Introductory Offer Available !! Call For Details



- Low insertion loss
- Compact design
- High selectivity-narrow bandwidth
- Factory Tuned
- Notch Filter & Preselector available
- Utilize existing handhelds and mobiles

Public Service Agencies have been asking us for years to utilize their existing VHF handhelds and mobiles with the SVR-200VB, VHF Vehicular Repeater, effectively extending the range of their portable equal to their high power mobiles. Well, we listened and ***VHF Inband is now available.***

PYRAMID COMMUNICATIONS

Pyramid Communications
15185 Triton Lane, Suite 102
Huntington Beach, CA 92649
Phone: 714-901-5462
Fax: 714-901-5472
www.pyramidcomm.com

CIRCLE (106) ON FAST FACT CARD

HANDS FREE COMMUNICATIONS GEAR

NEXTEL®

iDEN / MIKE / SouthernLINC

"Our products incorporate a Patent-Pending PTT (Push-To-Talk) Button Technology that enables you to use the Direct-Connect "2-way" feature. Most control telephone functions as well."

All Products Manufactured by:

Klein electronics
"The Leader in Audio Accessories"

www.HeadsetUSA.com

1-800-959-2899

iDEN is the trademark property of Motorola
NEXTEL logo is the trademark property of NEXTEL COMMUNICATIONS, Inc.

CIRCLE (107) ON FAST FACT CARD

Rentals and Repair

Classified Advertising Works!

Minitor II Pager Repair Just $37.50
Price includes all Parts and Labor
5 Day turn time
90 Day Warranty
Dealer Price
800-822-2180
1300 N FL Mango Rd #21
West Palm Beach, FL 33409
Water/Physical Damage and housing parts not included
P&W Paging & Wireless Service Center

MOTOROLA $49 Flat Rate Plus Parts
PORTABLE & MOBILE REPAIR
• Quick Turn Around • Free Return Shipping
• Factory Trained & FCC Licensed Techs
ARCOM 800•567•5636
www.arcom2way.com
10117 W Oakland Park Blvd. Suite 321, Sunrise, FL 33351

MOSS COMMUNICATIONS
MOTOROLA RADIO RENTALS
Ten years of great service to you!
Call for a quote.
We'll make your next project affordable.
www.mosscom.com
800-822-MOSS

PRS $39 flat rate plus parts
MOTOROLA - PORTABLE & MOBILE REPAIR
FACTORY TRAINED & FCC LICENSED TECHS
FREE RETURN SHIPPING - QUICK TURN AROUND
PORTABLE RADIO SERVICE, LLC
209 KERA Dr. • Mtn. View, AR 72560
Voice: 800-245-4310
Fax: 870-269-5666
www.portableradioservice.com

MOTOROLA
RADIO RENTALS
• HT1000, GP300, P200
• Intrinsically Safe
• Full Line of Radio Accessories
• Mobiles & Repeaters
• 24-Hour Service
• Dealer Inquiries Invited
1-800-283-COMM
EVENT RENTAL COMM., INC.
e-mail: eventcomm@aol.com

All CCII Labels

WHITE, ORANGE, GREEN AND RED BUTTONS AVAILABLE

$12.50 ea

CCII PROGRAMING AVAILABLE

ORDERS SHIPPED IN 14 DAYS

NORTHEASTERN
Communications, Inc.
Waterbury, CT (203) 575-9008

Sacramento Communications Co, LLC
World-Wide Reseller of Previously Owned Two-Way Radio Equipment
sales@saccomco.com

Toll Free 1.800.772.3547

Visa/Mastercard/American Express/COD
We buy used Radio Equipment !

E-Mail or fax the model #'s, a description, and picture of the item(s) to: ***purchasing@saccomco.com***

Fax 209.755.4939

Or call our purchasing agent at:
Phone 209.755.4944

Rentals and Repair

Loudoun Communications Inc.
Communications Systems
REPAIR DEPOT

QUALITY SERVICE ON MICROPROCESSOR-BASED MOBILES, PORTABLES AND CONTROL HEADS.
SURFACE MOUNT REPAIR. MOST REPAIRS $75 PLUS PARTS.
FREE ESTIMATES.

Warranty Service Available On:
Com-Net Ericsson • Kenwood

585 Factory Shoals Rd.
Austell, GA. 30168 770-948-9566

Cardinal Electronics, Inc.

SERVICE MONITOR
Repair & Calibration
Exclusive Monitor repair since 1973
NIST TRACEABLE NEW LOWER RATES
Visit our Website: cardinalelec.com

1631 N. Evergreen Ave. Arlington Heights, IL 60004
Ph. (847) 797-7820 Fax (847)870-0342

Computer Software

Find Solutions

To Your RF Coverage and Site Management Problems . . . On your own PC!

For either microwave links or area coverage, our Terrain Analysis Package (TAP)™ software helps you find system design solutions in-house.

See details and download demo from our web site!

SOFTWRIGHT, LLC
1010 So. Joliet St. Suite 204
Aurora, CO 80012-3150 USA
Tel. (303) 344-5486 • Fax (303) 344-2811
www.softwright.com
e-mail: sales@softwright.com

CIRCLE (109) ON FAST FACT CARD

Disrespect of amateur radio on Sept. 11

As I've noted previously, I am a history buff. If history teaches anything, it is that we must learn from our mistakes, or we are destined to repeat them. I know this firsthand.

Do you recall the tragedy that was the Iranian revolution of 1979?

I remember Nov. 4, 1979. That day, Iranian students seized the American Embassy in Tehran and held 52 Americans hostage. It was the day I knew my world was going to get a lot more interesting. I was a flight line maintenance officer with an air rescue unit and was one of the first aircraft maintenance officers on two advanced special-forces helicopters—the only two in the Air Force inventory.

One rescue attempt ended up as a tragedy itself. "Eagle Claw" was plagued by failures. The chief failure was what I call the "chaos of command." From mission planning to mission departure, the "on-the-fly" approach to the mission contributed to the ground disaster that was Desert One. This is not to take anything away from the men of the Air Force, Navy and Marines who participated. They were faced with a task I believe they were not prepared to do, and they did the best job they could.

But what many do not realize is that there was to be a second attempt that included our special ops helos. I saw this event firsthand. Did we learn from Eagle Claw? No. We faced the same command chaos. "Honey Badger" (the code name for the rescue effort) never went. The American government traded Iranian assets for the release of the hostages, and the mission was canceled.

In the postmortem of Honey Badger, did we learn from the command chaos? Yes. Did we take the appropriate action? Supposedly. Did we have problems in future actions? Yes.

Chaos of command

I was reminded of Eagle Claw and Honey Badger as I researched the actions of the amateur radio operators during the events of Sept. 11. During my interviews with Charles Hargrove (N2NOV), the ARRL NYC district emergency coordinator who supported the New York World Trade Center efforts, and Tom Gregory (N4NW), the ARRL Virginia section emergency coordinator supporting the Pentagon, I flashed back to 1979.

Both men, and the volunteers who worked with them, faced many obstacles in bringing badly needed communications capability to the rescue efforts at the WTC and the Pentagon. Among them was the same obstacle we faced during the Iranian hostage situation: the chaos of command.

Was this to be expected given the nature of the attacks? Of course. Who could prepare for something like Sept. 11? But, in listening to them describe the reaction of the "command" authorities to the ARRL volunteers, it appears to me the Office of Emergency Management in New York and the Washington police authority have little respect for amateur radio emergency service volunteers.

Hunting the OEM

In New York, the problem was the OEM. When ARRL volunteers were ready to respond to support the OEM, they had to find it first. (The OEM was forced out of its location at 7 WTC.) On two occasions, Hargrove had to *hunt* it down. When Hargrove located it, he was able to determine that it needed phone lines. He was able to work the with the telephone company and obtain the lines. Logic dictates that, had the OEM understood the need for the amateur radio capability to begin with, time would have been saved. Communications could have been improved, and who knows what could have been accomplished had that communications been available sooner?

Security issues at the Pentagon

While Hargrove was facing command and control issues in New York, Gregory found security at the Pentagon to be a real obstacle. He noted that, initially, security was confused. At first, he *was* able to obtain ID badges for his people from military security. Within a few days, though, as more volunteers arrived to relieve the first ones, Gregory was faced with getting ID cards for his volunteers from civilian law enforcement—which had placed a limit on the number of cards issued. The ARRL volunteers eventually had to go through the American Red Cross and Salvation Army to obtain the cards. Both organizations themselves were also restricted to the number they could get. This put both organizations in a bind.

Lessons from Sept. 11

Are these new problems for ARRL volunteers? To the degree that they happened I would say yes. But, the fact they happened, at all tells me that New York and Washington officials need to analyze how important amateur radio is to them during disasters and need to involve ARRL in preparations. But, will they? History tells me they won't. My gut feel is *they better*. And not just in Washington and New York, but in every city in America. The war is raging, and we cannot be so foolhardy as to believe it will not be brought to our shores another time. Again, amateur radio volunteers will have to fight an uphill battle. It's maddening.

Editor
rlesser@primediabusiness.com

As good as he is, he'll never sniff out RF Radiation

The Bloodhound

A breed of dog which hunts by scent. Tracking or trailing is a bloodhound's main purpose. They are affectionate, but somewhat shy. Bloodhounds do drool.

Narda's RF Personal Monitors — Provide Total Personal Protection from RF Radiation

Exposure to potentially harmful levels of odorless and invisible RF radiation is increasing. Today's radiation sources are numerous and include:

- Transmission installations on towers and roofs for wireless and telecommunications.
- Military radar and transmission installations, antenna farms and their connecting leads.
- Plants for electrolysis, smelting, heating, hardening, plastic welding and semiconductor production.

Narda Safety Test Solutions offers two families of personal monitors which activate alarms when RF radiation exceeds the preset alarm levels. The monitors are lightweight, easy-to-use, and require no technical knowledge to operate. They cover the entire RF spectrum, conform to major world standards, and employ proprietary technology for immunity from false alarms. And, they can be connected to PCs to download measurement data.

Don't trust your workplace safety to a drooling dog. Contact Narda Safety Test Solutions today.

RadMan XT RF Personal Monitor
3 MHz – 40 GHz Range
Dual Purpose: Can be used as personal monitor and for pre-compliance measurements.

Nardalert XT® RF Personal Monitor
100 kHz – 100 GHz Range
Patented Design Two-level, user-adjustable Audio Alarms and a Vibrator Alarm.

Visit Us At IWCE Booth #10080

narda
Safety Test Solutions
an L3 communications company

USA
435 Moreland Road, Hauppauge, NY 11788
Tel 1-631 231-1700 **Fax** 1-631 231-1711
E-Mail NardaSTS@L-3COM.com **www.narda-sts.com**

GERMANY
Sandwiesenstrasse 7, D-72793 Pfullingen
Tel +49-7121-9732-0 **Fax** +49-7121-9732-90
E-Mail support@narda-sts.de **www.narda-sts.de**

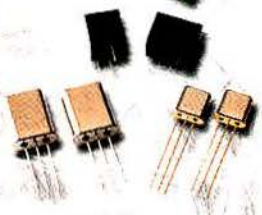
CIRCLE (2) ON FAST FACT CARD

COMMUNICATIONS SPECIALISTS, INC.

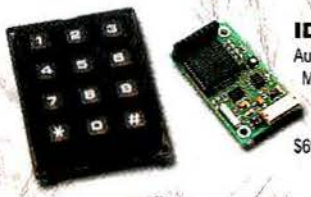
LEADING THE WORLD IN ADD-ON TONE SIGNALING PRODUCTS FOR OVER 30 YEARS

- One Year Warranty on all products
- Order Factory Direct – No Minimums
- Same day shipping on most orders
- Toll free voice and fax for easy ordering
- 24 hour "InfoFax" and website application notes for around-the-clock tech support

DCS-23
Digital Coded Squelch Encoder-Decoder
Jumper Programmable to all 106 DCS codes.
1.36" x 1.18" x 0.25"
$59.95



FILTERS
Call us for the lowest cost, 12.5kHz channel spacing, exact replacement crystal and ceramic IF filters for part 90 Reframing. Complete kits available for most popular radios at $15.00 to $25.00/kit.



ID-8
Automatic Morse Station Identifier
Meets all FCC ID requirements.
Fully field programmable with included keypad.
1.85" x 1.12" x .35"
$69.95

PE-1000
Desktop Paging Encoder
Two-Tone Sequential.
Other formats and custom tones available.
7.5" x 7.8" x 2.7"
$224.95

SS-64
CTCSS Encoder
Microminiature, DIP switch programmable.
Includes 64 tones from 33.0 to 254.1 Hz.
0.66" x 1.08" x 0.21"
$28.95

TE-32
Multi-tone CTCSS Encoder
Rotary dial switchable to any of the standard 32 EIA tones.
5.25" x 3.3" x 1.7"
$49.94
TE-32D with LED display, $99.95

TP-3200
Shared Repeater Tone Panel
Full featured and with all 157 CTCSS/DCS codes.
Desktop and rack mounted versions.
$279.95

TS-64
CTCSS Encoder-Decoder
Microminiature jumper programmable.
Includes 64 tones from 33.0 to 254.1 Hz.
0.78" x 1.70" x 0.25"
$54.95 (model TS-64DS with DIP switch, $57.95)

NOW MORE THAN EVER, YOUR BEST SOURCE FOR QUALITY TONE SIGNALING PRODUCTS!

WE'RE PLEASED TO ANNOUNCE THE ACQUISITION OF THE

Selectone

LINE OF TONE SIGNALING AND ENCRYPTION PRODUCTS, TO BETTER FULFILL YOUR TONE SIGNALING REQUIREMENTS.

ST-20, 25, 50
Voice Encryption Units
PRIVATE COLLECTION™ series provides low to high level security for two-way radio voice applications.
PC programmable with optional kit.
0.9" x 1.5" x 0.25"
$79.00 - $299.00

ST-804A
Multi Format Encoder
Encodes Two-Tone Sequential, Burst Tone, or DTMF ANI/ENI Formats.
PC programmable with optional kit, or factory programmed for free.
1.15" x 0.84 x 0.15"
$59.95

ST-809B
Multi Output DTMF Decoder
Decodes address codes of 1 to 7 digits from all 16 DTMF characters.
Multiple outputs and remote reset capability.
PC programmable with optional kit, or factory programmable for free.
1.34" x 0.85" x 0.21"
$59.95

ST-888
Desktop ANI Decoder / Display Unit
Use with ST-804A or other DTMF ANI encoders for monitoring of fleet radio users and control systems.
$499.00

COMMUNICATIONS SPECIALISTS, INC.
426 WEST TAFT AVENUE • ORANGE, CA 92865-4296
(714) 998-3021 • FAX (714) 974-3420
ENTIRE U.S.A. (800) 854-0547 • FAX (800) 850-0547
http://www.com-spec.com

CIRCLE (3) ON FAST FACT CARD